THE SECRETARY OF HEALTH AND HUMAN SERVICES
WASHINGTON, D.C. 20201

MAY 20 1993

The Honorable Albert Gore, Jr.
President of the Senate
Washington, D.C. 20510

Dear Mr. President:

I am pleased to submit the accompanying compilation of research and demonstration studies satisfying section 4027(c)(2)(A) of Public Law 101-508, the Omnibus Budget Reconciliation Act of 1990, which states:

> "By not later than April 1, 1993, the Secretary of Health and Human Services shall submit the research findings upon which the proposal described in paragraph (1) shall be based to the Committee on Finance of the Senate and the Committee on Ways and Means of the House of Representatives."

Paragraph (1) states:

> "The Secretary of Health and Human Services shall develop a proposal to modify the current system under which payment is made for home health services under title XVIII of the Social Security Act or a proposal to replace such a system with a system under which such payments would be made on the basis of prospectively determined rates. . . ."

We have been funding a number of research and demonstration studies relating to prospective payment for home health services, including the Home Health Agency Prospective Payment Demonstration, studies of case-mix systems, and analyses of economies of scale. Some of this research, as well as research sponsored by other organizations, is complete and is described below. A bibliography and summary of these reports are enclosed (Enclosure 1).

We implemented phase 1 of the Home Health Agency Prospective Payment Demonstration in October 1990. Phase 1 tests a per visit rate-setting methodology. We plan to implement phase 2 of the demonstration which tests a per episode rate-setting methodology in the Fall of 1993. On December 9, 1991, we submitted a "Status Report on the Implementation of the Home Health Agency Prospective Payment Demonstration," which described the status and design of the demonstration. Mathematica Policy Research (MPR) is conducting the evaluation of phase 1 of this

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There are a number of studies, several of which we have sponsored, of case-mix systems for home health services. The Georgetown University report entitled "Develop and Demonstrate a Method for Classifying Home Health Patients to Predict Resource Requirements and to Measure Outcomes" is at Enclosure 3. This study collected data on patient characteristics and service use and classified patient care, using nursing diagnoses and interventions. The project developed a system for predicting patient needs for home care services. The MPR report entitled "Case-Mix Analysis Using Georgetown Data: Home Health Prospective Payment Demonstration," involved a variety of multivariate statistical analyses of the Georgetown University data base (Enclosure 4). The MPR report entitled "Evaluation of the Home Health Prospective Payment Demonstration: Summary of the Clinical Panel Meeting on Home Health Treatments" (Enclosure 5) discusses the findings of an expert panel. The panel identified patient characteristics that were related to the various treatment services which had been determined as predictors of resource use in the case-mix analyses. Enclosure 6 contains several additional articles of studies on case-mix for home health services.

A number of studies, several of which we have sponsored, have dealt with economies of scale for home health services. Enclosure 7 contains several articles on this topic.

For your information, we have also enclosed a copy of the demonstration design report prepared by Abt Associates Inc. (Enclosure 8).

We are continuing to conduct research on systems that would adequately respond to the varying nature and types of patients receiving home health services. We will be happy to make copies of additional research studies available to you as the research is completed.

Sincerely,

Donna E. Shalala

Enclosures

THE SECRETARY OF HEALTH AND HUMAN SERVICES
WASHINGTON, D.C. 20201

MAY 20 1993

The Honorable Thomas S. Foley
Speaker of the House
of Representatives
Washington, D.C. 20515

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THE SECRETARY OF HEALTH AND HUMAN SERVICES
WASHINGTON, D.C. 20201

MAY 20 1993

The Honorable Daniel P. Moynihan
Chairman, Committee on Finance
United States Senate
Washington, D.C. 20510

Dear Mr. Chairman:

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THE SECRETARY OF HEALTH AND HUMAN SERVICES
WASHINGTON, D.C. 20201

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Chairman, Committee on
Ways and Means
House of Representatives
Washington, D.C. 20515

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REPORT TO CONGRESS

RESEARCH FINDINGS ON MEDICARE HOME HEALTH AGENCY PROSPECTIVE PAYMENT

DONNA E. SHALALA
SECRETARY OF HEALTH AND HUMAN SERVICES
1993

RESEARCH MOST DIRECTLY RELEVANT TO HOME HEALTH PROSPECTIVE PAYMENT

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Case-Mix Adjustment

Brown, Randall S., Barbara R. Phillips, Valerie A. Cheh, Dexter Chu, Peter Schochet, William J. Foley, Kenneth G. Manton, and Amy C. Klein. Case-Mix Analysis Using Georgetown Data: Home Health Prospective Payment Demonstration. Report submitted to the Health Care Financing Administration. Princeton, NJ: Mathematica Policy Research, November 25, 1991.

Foley, William, Donald Schneider, Mary Dowling, Brant Fries, Marie Gavazzi, Pinki Srivastava, Diane E. Halstead, Joanne Thorpe, Peter Tremblay, John Riordan, Linda Court, Richard Brook, Nancy McCarty, and Judy Wells. Development of a Survey, Case Mix Measurement System, and Assessment Instrument to Rationalize the Long Term Care Home Care System. Volume 1. Report submitted to the New York State Department of Health, Office of Health Systems Management. Troy, NY: Rensselaer Polytechnic Institute, June 1986.

Jencks, S., A. Dobson, P. Willis, and I. Feinstein. Evaluating and Improving the Measurement of Hospital Case Mix. *Health Care Financing Review*, 1984 Annual Supplement: 1-11.

Manton, K., and T. Hausner. A Multidimensional Approach to Case Mix for Home Health Services. *Health Care Financing Review*, 8 (4): 37-54, summer 1987.

Nyman, J., and M.A. Svetlik. Does the Average Cost of Home Health Care Vary with Case Mix? *Public Health Reports*, 104: 335-341, July-August 1989.

Saba, Virginia K. Develop and Demonstrate a Method for Classifying Home Health Patients to Predict Resource Requirements and to Measure Outcomes. Report submitted to the Health Care Financing Administration. Washington, DC: Georgetown University, School of Nursing, February 1991.

Schore, Jennifer, and Barbara R. Phillips. Evaluation of the Home Health Prospective Payment Demonstration: Summary of the Clinical Panel Meeting on Home Health Treatments. Report submitted to the Health Care Financing Administration. Princeton, NJ: Mathematica Policy Research, July 1992.

Smith, Mary E., Rodney Baker, Laurence G. Branch, Robert C. Walls, Richard M. Grimes, Judith M. Karklins, Michael Kashner, Rebecca Burrage, Ann Parks, Paul Rogers, Ann Saczuk, and Marilyn Wagster-Weare. Case-Mix Groups for VA Hospital-Based Home Care. *Medical Care*, 30 (1): 1-16, January 1992.

Economies of Scale

Hay, Joel W., and George Mandes. Home Health Cost-Function Analysis. *Health Care Financing Review*, 5 (3): 111-116, spring 1984.

Kass, David I. Economies of Scale and Scope in the Provision of Home Health Services. *Journal of Health Economics*, 6:129-146, 1987.

Nyman, J., and M.A. Svetlik. Does the Average Cost of Home Health Care Vary with Case Mix? *Public Health Reports*, 104: 335-341, July-August 1989.

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Schmitz, Robert, Judith Williams and Henry Goldberg. Home Health Agency Prospective Payment Demonstration Report on Project Design. Report submitted to the Health Care Financing Administration. Cambridge, MA: Abt Associates Inc., February 1990.

Thornton, Craig, Walter Leutz, Barbara Phillips, and Catherine Wynkoop. Almost Business as Usual: A Case Study of Selected Home Health Agencies during the First Year of the Per-Visit Prospective Payment Demonstration. Report submitted to the Health Care Financing Administration. Princeton, NJ: Mathematica Policy Research, June 1992.

PROSPECTIVE PAYMENT SYSTEM FOR HOME HEALTH SERVICES

SUMMARY OF REPORTS AND STUDIES

Case-Mix Adjustment

Develop and Demonstrate a Method for Classifying Home Health Patients to Predict Resource Requirements and to Measure Outcomes. Saba, V.K. 1991. The major objective of the Georgetown University School of Nursing Home Health Care Classification research project was to develop a method to assess and classify the home health Medicare patients in order to predict their need for nursing and other home health care services as well as measures of outcomes of care. To accomplish this goal, data on actual resource use which could be objectively measured were used to predict resource requirements. Using 1986 data, the descriptive analysis demonstrated that home health care is provided predominately to a white, suburban, young-elderly population. Less advantaged and higher risk patients appear to be more likely to enter long term care facilities. The best approach to predicting home health care use is based on nursing diagnoses and nursing interventions rather than functional status or medical diagnoses. Demographics have a relatively small impact on resource use and selected demographics can be used to improve predictions based on nursing diagnoses or nursing interventions. Home health care cases can be classified into three cohorts based on the length and type of case in days. The number of visits in the first 30 days will be significantly lower for the short term cases than for intermediate or long term cases regardless of nursing diagnoses or demographic characteristics.

Case-mix Analysis Using Georgetown Data: Home Health Prospective Payment Demonstration. Brown, R.S., et al. 1991. This report presents results of the analyses to develop a case-mix adjustor for per episode home health prospective payment using data collected by the Georgetown University School of Nursing and makes recommendations for future analysis. Results from four types of models are presented and discussed, including regression models, classification and regression tree models, automated grouping systems, and grade-of-membership. Recommendations for further analysis using data gathered from the demonstration are made, based on the analyses in this report.

Evaluation of the Home Health Prospective Payment Demonstration: Summary of the Clinical Panel Meeting on Home Health Treatments. Schore, J., and Phillips, B. 1992. This report summarizes the suggestions of a clinical panel convened in May 1992 as one part of the task to develop a case-mix adjustor. The mission of the panel was to identify the characteristics of patients associated with a group of home health treatments that Mathematic Policy Research (MPR) found were associated with higher-than-average home health episode costs. These treatments included skilled nursing treatments, skilled nursing interventions, physical, occupational, and speech therapy treatments, medical social services, and home health aide treatments. The panel reviewed the work of MPR and made recommendations regarding patient and informal caregiver characteristics that would be predictive of an episode of home health care. Panel members also raised several issues related to developing a prospective payment system for Medicare home health care.

<u>Development of a Survey, Case Mix Measurement System, and Assessment Instrument to Rationalize the Long Term Care Home Care System. Final Report</u>. Foley, W., et al. 1986. The main goal of this research was to develop a patient classification system and the related assessment and information system to allow for the rational and effective expansion of home care services in New York State. The project consisted of four major activities: 1) patient characteristics and care needs; 2) patient classification system; 3) redefine program boundaries; and 4) develop screening and assessment instruments. Several recommendations to New York State regarding its long term home health care program are made, based on these activities.

<u>Evaluating and Improving the Measurement of Hospital Case Mix</u>. Jencks, S.F., et al. 1984. The foundation of case-based prospective payment is the case-mix classification system. The purpose of classification systems is to group together patients with similar treatment requirements. The systems described in this issue take a variety of theoretical and practical approaches to classification. The critical issue in comparing these systems is whether the variation in treatment requirements which is not explained by the classification system is associated with particular groups of patients, particular hospitals, or particular groups of hospitals in such a way as to result in unfair reimbursement. The authors suggest criteria for comparing classification systems and a research agenda for clarifying the fairness of different approaches.

<u>A Multidimensional Approach to Case Mix for Home Health Services</u>. Manton, K.G., and Hausner, T. 1987. Developing a case-mix methodology for home health services is more difficult than developing one for hospitalization and acute care services, because the determinants of need for home health care are more complex and because of the difficulty in defining episodes of care. To evaluate home health agency case mix, a multivariate grouping methodology was applied to records from the 1982 National Long Term Care Survey linked to Medicare records on home health reimbursements. Using this method, six distinct health and functional status dimensions were identified. These dimensions, combined with factors describing informal care resources and local market conditions, were used to explain significant proportions of variance of individual differences in Medicare home health reimbursements and numbers of visits. Though the data were not collected for that purpose, the high level of prediction strongly suggests the feasibility of developing case-mix strategies for home health services.

<u>Case-Mix Groups for VA Hospital-Based Home Care</u>. Smith, M.E., et al. 1992. The purpose of this study is to group hospital-based home care (HBHC) patients homogeneously by their characteristics with respect to cost of care to develop alternative case mix methods for management and reimbursement (allocation) purposes. Six Veterans Affairs (VA) HBHC programs in Fiscal Year (FY) 1986 that maximized patient, program, and regional variation were selected, all of which agreed to participate. All HBHC patients active in each program on October 1, 1987, in addition to all new admissions through September 39, 1988 (FY 88) comprised the sample of 874 unique patients. Statistical methods include the classification and regression trees (CART),

analysis of variance, and multiple linear regression techniques. The resulting algorithm is a three-factor model that explains 20 percent of the cost variance. Similar classifications such as the RUG-II, which is utilized for VA nursing home and intermediate care, the VA outpatient resource allocation model, and the RUG-HHC, utilized in some States for reimbursing home health care in the private sector, explained less of the cost variance and, therefore, are less adequate for VA home care resource allocation.

Economies of Scale

Home Health Care Cost-Function Analysis. Hay, J.W., and Mandes, G. 1984. An exploratory home health care (HHC) cost-function model is estimated using State rate-setting data for the 74 traditional (nonprofit) Connecticut agencies. The analysis demonstrates U-shaped average cost curves for agencies' provision of skilled nursing visits, with substantial diseconomies of scale in the observable range. It is determined from the estimated cost function that the sample representative agency is providing fewer visits than optimal, and its marginal cost is significantly below average cost. The finding that an agency's costs are predominantly related to output levels, with little systematic variation due to other agency or patient characteristics, suggests that the economic inefficiency in a cost-based HHC reimbursement policy may be substantial.

Economies of Scale and Scope in the Provision of Home Health Services. Kass, D.I. 1987. This study examines the issue of economies of scale for home health agencies. A quadratic cost function is estimated utilizing a 1982 national data set based on Medicare Cost Reports for 2000 home health agencies. This paper concludes that neither economies of scale nor scope are substantial in the provision of home health services.

Does the Average Cost of Home Health Care Vary with Case Mix? Nyman, J.A., and Svetlik, M.A. 1989. The relationship between the average cost of home health care and the case mix of patients served by the home health agency is investigated using 1983 data from Wisconsin's home health care agencies. In contrast to previous work, case mix is shown to have a significant effect on the home health agency's average costs. The methods used in the previous work are evaluated, and differences between the earlier study and the present study are discussed to explain divergent results. Also, average costs are shown to decrease with output, to increase with the proportion of private patients served by the agency, and to be higher if the home health agency is located in an urban area or if it has a proprietary charter. The implications of this research for the design of an appropriate home health reimbursement policy are discussed. Primarily, it is argued that, although future research might confirm the relationship between average costs and case mix for home health agencies, we cannot necessarily conclude that reimbursement rates must be adjusted to account for differences in case mix as many States are now doing for nursing home reimbursement. Policies must take into account the fundamental differences between home health agencies and nursing homes, and their respective markets, in order to be effective.

Other

Home Health Agency Prospective Payment Demonstration: Report on Project Design. Schmitz, R.J., et al. 1990. This report presents the project design for the Home Health Agency Prospective Payment Demonstration. Included in the report are discussions of the payment methods, sample design, implementation activities, setting demonstration payment rates, and the evaluation plan.

Almost Business as Usual: A Case Study of Selected Home Health Agencies During the First Year of the Per-Visit Prospective Payment Demonstration. Thornton, C., et al. 1992. The authors interviewed key staff at 22 of the 49 home health agencies in the demonstration regarding operations in the first year of the demonstration. During this time, agencies were generally feeing their way through the new incentives created by the demonstration and adjusting to the demonstration-specific operating requirements. A few agencies had specific plans for changes or had already altered their operations, although agencies had been planning many of these alterations prior to participating in the demonstration. Overall, the demonstration appears to have been implemented as designed and to provide a solid basis for judging impacts and potential of per-visit rate setting.

IMPORTANT

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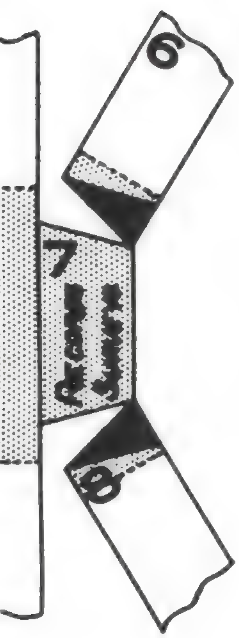

Contract No.: HCFA 500-900047
MPR Reference No.: 7960-060

ALMOST BUSINESS AS USUAL: A CASE STUDY OF SELECTED HOME HEALTH AGENCIES DURING THE FIRST YEAR OF THE PER-VISIT PROSPECTIVE PAYMENT DEMONSTRATION

June 1992

Authors:

Craig Thornton
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Walter Leutz and Catherine Wynkoop are at the Bigel Institute for Health Policy Research at Brandeis University. Barbara Phillips and Craig Thornton are at Mathematica Policy Research, Inc.

Submitted to:

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CONTENTS (continued)

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CASE NOTES

FIGURES

ALMOST BUSINESS AS USUAL: A CASE STUDY OF SELECTED HOME HEALTH AGENCIES DURING THE FIRST YEAR OF THE PER-VISIT HOME HEALTH PROSPECTIVE PAYMENT DEMONSTRATION

EXECUTIVE SUMMARY

On the basis of our interviews with key staff at 22 of the 49 home health agencies in the demonstration, we would characterize operations during the first year as almost business as usual. During this time, agencies were generally feeling their way through the new incentives created by the demonstration and adjusting to the demonstration-specific operating requirements. A few agencies had specific plans for changes or had already altered their operations, although agencies had been planning many of these alterations prior to participating in the demonstration. Overall, the demonstration appears to have been implemented as designed and to provide a solid basis for judging the impacts and potential of per-visit rate setting.

These preliminary conclusions about the demonstration process were made as part of a comprehensive evaluation of the demonstration. The observations presented in this report, and in the subsequent implementation analysis report, will provide background information for interpreting the quantitative estimates of the demonstration's impacts and for designing any efforts to implement per-visit prospective rate setting on a broader basis. The material presented here documents early demonstration operations and will help guide the development of subsequent evaluation activities.

THE HOME HEALTH PROSPECTIVE PAYMENT DEMONSTRATION

The Health Care Financing Administration is undertaking the Home Health Prospective Payment Demonstration to test a major change in how home health agencies would be paid for the services they provide to Medicare beneficiaries. Specifically, the demonstration is examining the extent to which the switch from a cost-reimbursement payment system to a prospective payment system will induce agencies to provide home health care more efficiently while maintaining the quality of the care and ensuring that Medicare beneficiaries continue to have access to care. A total of 49 home health agencies in California, Florida, Illinois, Massachusetts, and Texas entered the demonstration of ***per-visit*** prospective rate setting beginning in October 1990. This demonstration will continue through December 1994.[1] A demonstration to test ***per-episode*** prospective rate-setting is planned to start in 1993.

The evaluation of the per-visit demonstration will assess the impacts of a payment system of per-visit prospective rates on 27 agencies that were selected randomly from the 49 agencies participating in the demonstration. The other 22 agencies will continue to operate under the cost-reimbursement system, and will provide data to the demonstration for comparison purposes. Prospective rates will be set for each agency according to that agency's cost for the year immediately preceding the demonstration. At the end of each ensuing year of the demonstration, each agency's rates will be adjusted to reflect general changes in the prices of health care services. The adjusted rates will then

[1]Since this report was prepared, one agency has dropped out of the demonstration so that there are now only 48 agencies. Because this report describes the demonstration as it existed in late summer 1991, we have included all 49 agencies in our discussion.

become the prospective rates for the following year. Agencies in the treatment group will be paid on this basis for three years, after which they will return to the cost-reimbursement system, or to whatever payment system is in place at the time.

IMPLEMENTATION ANALYSIS GOALS AND METHODS

We are conducting the implementation analysis as a part of a comprehensive evaluation of the per-visit demonstration. The information collected in the implementation analysis will support an impact analysis that will estimate the net effect the shift to prospective rate setting has on average costs and on access to care and quality of care. The implementation analysis will support the impact analysis by documenting: (1) whether the demonstration was implemented as designed; (2) the context in which the demonstration operated and how that context might influence the observed impacts; and (3) the steps agencies took to control costs and the ways those steps will manifest themselves in the quantitative data on costs and care.

The implementation analysis also seeks to inform any efforts to implement per-visit prospective rate setting on a national basis. Thus, we will look at the ways in which a national program might differ from the demonstration operations and the ways such differences might influence demonstration impacts. We will also look at any operational problems in the demonstration and try to draw lessons that will improve the operation of any future efforts to implement prospective payment.

In order to address these issues, we are conducting case studies of 22 of the 49 home health agencies participating in the demonstration. These 22 agencies (11 treatment agencies and 11 control agencies) are a non-random but broadly representative subset of all the demonstration agencies. They were chosen from all five of the demonstration states, and were selected judgmentally to represent agencies both with different characteristics (auspice, size, membership in a chain, previous growth rates, percent of visits covered by Medicare, and number of competing Medicare-certified home health agencies) and with different prospects for controlling costs under the per-visit prospective payment system.

To conduct the case studies, we will follow these agencies over the three-year course of the demonstration. We plan to focus on seven key aspects of demonstration operations: (1) corporate and strategic planning, (2) changes in the home care population and in Medicare coverage, (3) clinical costs, (4) administrative costs, (5) access to care and quality of care, (6) relations between the agencies and the various demonstration contractors, and (7) perceptions about a national program of prospective payment.

This initial implementation analysis report looks at operations during the first year of demonstration operations. This is a time of transition. Treatment and control agencies are adjusting to the demonstration-specific features such as the special patient intake data form and the use of a single fiscal intermediary for all demonstration agencies. In addition, the treatment agencies are adjusting to life under prospective rate setting. We examined operations at this time in order to assess what was happening to the agencies prior to their entrance to the demonstration, their initial reactions to the demonstration, and their plans for activities under the demonstration. We also wanted to describe the structure of the agencies and the markets in which they operate.

To prepare this report, we relied primarily on information collected through a series of interviews with staff at the 22 agencies. Between August 1991 and October 1991, we conducted in-person

interviews with the staff of treatment agencies and conducted telephone interviews with the staff of the control agencies. We spoke with chief executive officers, chief financial officers, clinical supervisors, nurses, and therapists. We sought to identify the major characteristics of home health agencies and the principal ways in which the agencies respond to the incentives of prospective payment. In addition, we have drawn on our experience with other agencies, including other home health agencies and other health and social service agencies, to provide a context for interpreting what we have learned from our interviews with the staff at the demonstration agencies. We also reviewed the agencies' Medicare cost reports in order to collect quantitative information on growth rates, the proportion of agency visits covered by Medicare, and past revenue and cost experience.

CORPORATE AND STRATEGIC PLANNING

The features of the corporate and strategic plans of the 22 home health agencies were similar, although larger agencies were more likely to have formal written plans than were smaller agencies. Three common missions emerged in the strategic plans of all agencies (whether formal or informal): growing to meet community needs, fulfilling service missions, and improving efficiency. Agencies expressed the need to balance their desire to serve their communities with the need to remain financially viable, or, as one agency director put it, to "balance the mission with the margin." Fifteen of the 22 agencies (including 6 of the 8 for-profit agencies) listed service to their communities as their primary goal. Six agencies further indicated a desire to care for all patients, regardless of a patient's ability to pay. At the same time, directors indicated that they must promote efficiency in order to survive and to continue serving the community. Indeed, agency survival appeared to be a dominant theme in many of the plans. Directors emphasized the necessity of maintaining constant attention to efficiency, recruiting and retaining staff, offering ever more highly skilled services, looking for new referral sources and maintaining old ones, refining paperwork systems, keeping pace with changes in payer requirements, and engaging in other survival-enhancing activities.

Overall, the home health industry is clearly experiencing a good deal of change and competition that compels agencies constantly to assess the services they offer, the areas they serve, their payment sources, and their marketing activities.

In the case study, treatment agencies and control agencies appear to differ in some ways: in particular, treatment agencies seem more likely to add new services, take contracts with prepaid providers, and expand to serve new geographic areas. Treatment agencies also appear to be somewhat less likely than control agencies to be planning for rapid growth. This difference seems to reflect a higher rate of previous growth by control agencies and a tendency for agencies that have grown rapidly to plan for additional growth. However, the small sample size available for the case-study analysis makes any conclusion about treatment-control differences tentative.

CHANGES IN THE HOME CARE POPULATION AND REVISIONS IN MEDICARE COVERAGE

Under the per-visit prospective rate-setting system, agencies have an incentive to shun patients who are likely to have lengthy, expensive visits. This incentive might prompt agencies to change the mix of patients whom they serve and might affect access to care. Agencies that are paid on a per-visit basis also have an incentive to provide more frequent visits and longer episodes of care to the patients whom they do accept. However, factors other than the implementation of per-visit rate setting might affect the mix of patients served by agencies and the amount of care the patients receive. The two most important factors are: (1) changes in the characteristics of the home health

care population; and (2) the revisions to the home health coverage regulations that became effective in July 1989. Thus, we asked agencies about changes in the mix of patients they serve and the factors that underlie any observed changes.

Most of the case-study agencies (18 of 22) reported that they now serve more acutely ill patients than was the case previously. The agencies tended to report two reasons for this change: (1) hospitals discharge patients earlier in their recovery process, so that discharged patients are generally more ill; and (2) agencies are providing more high-technology care, particularly intravenous (IV) therapy, in the home.

We asked the staff of the 22 home health agencies whether the revisions made by Medicare in July 1989 affected the care provided by their agencies. These revisions, which became effective 15 months before the demonstration began, expanded the types of home health care covered under Medicare. The most important of the changes provided for: (1) management and evaluation of a patient's care plan; (2) the liberalization of the interpretation of intermittent or part-time care to permit more per-day visits and per-week visits and to permit very infrequent visits (for example, every 60 days); and (3) the coverage of skilled care for chronic conditions (in general, only acute conditions had previously been covered).

The great majority of the case-study agencies (19 of 22) reported that the revisions had affected the care they provide. Nevertheless, the extent of the effect of the July 1989 revisions differed among the agencies. Six of the 19 agencies that reported an effect indicated that the revisions had prompted them to provide only slightly more care.

CLINICAL COSTS

Clinical costs account for the bulk of home health agency costs, and thus represent a major target for any cost-cutting approach induced by prospective rate setting. In order to assess the actions that agencies have taken in this area, we asked agency staff to describe their clinical procedures, whether any changes had affected clinical costs since the demonstration began, and, if so, the effects of those changes. We asked particularly about changes that affected costs for clinical personnel, staff supervision and training, supply expenses, and paperwork expenses.

On the basis of our case study, it appears that agencies are looking for ways to cut clinical costs, but that very few, if any, changes have resulted from the demonstration. Rather, both treatment agencies and control agencies appear to have long-standing interests in cost control, prompting the agencies to search continually for ways to use available resources more effectively to provide quality care. The changes that agencies do make appear to be directed toward increasing the efficiency and productivity of clinical staff and towards streamlining paperwork.

ADMINISTRATIVE COSTS

Much of the attraction of per-visit prospective rate setting lies in the potential to cut the administrative tasks associated with cost reimbursement. Home health agencies, the fiscal intermediary, and HCFA hope to find ways to reduce their administrative costs and to make the entire system more efficient under prospective rate setting. We asked agency staff whether the demonstration has imposed any extraordinary administrative costs on the agencies. The views of agencies about the costs imposed on them by the demonstration were split about evenly. Seven

agencies reported that the costs of the demonstration were "negligible" or "too small to notice," and four others reported that the costs were small or "not a big deal." In contrast, the nine other agencies that expressed an opinion about administrative costs in the demonstration generally perceived more substantial costs, sometimes ranging into the thousands of dollars for large agencies. In fact, all the agencies incurred some costs associated with the patient intake data form and the switch to the demonstration fiscal intermediary. Agency perceptions about these costs appear to be somewhat idiosyncratic, reflecting overall satisfaction with the process or frustration with specific problems as much as actual costs. What will really matter for our evaluation is the magnitude of demonstration-specific administrative costs compared with the net surplus achieved by agencies. We will monitor this margin as financial data become available from the agencies during the course of the demonstration.

The perceptions of agencies aside, we find that, if anything, administrative costs have risen during the first year of the demonstration. The major costs imposed by the demonstration are associated with the demonstration patient-intake data form and the switch that agencies have made from their previous fiscal intermediaries to the demonstration intermediary. The addition of these costs and the retention of the Medicare cost reports and associated audits will likely generate higher administrative costs for all agencies in the demonstration.

In a national program of per-visit payment, administrative costs should fall from their demonstration levels because the patient-intake data form (which would no longer be necessary) could be eliminated, and because, over time, most agencies should be able to develop smooth working relationships with their fiscal intermediaries. However, Medicare staff indicate that they plan to retain the Medicare cost report and most other aspects of the cost-reimbursement reporting requirements. Thus, even in the long-term, administrative costs under a system of per-visit prospective rates might fail to fall below the administrative costs of the cost-reimbursement system.

ACCESS TO CARE AND QUALITY OF CARE

Home health agencies have two major incentives to change access to care. First, agencies have an incentive to provide additional visits if the cost of rendering a visit is less than the per-visit payment. Second, agencies have an incentive to avoid patients who require lengthy, expensive visits and to seek patients who require inexpensive visits. These incentives might cause agencies to change their referral arrangements or procedures or their intake procedures.

With respect to the quality of care, per-visit prospective rate setting gives agencies an incentive to reduce the duration of visits and to reduce the time devoted to administrative review and monitoring. Reductions in either activity could compromise the quality of care. Reducing the duration of visits could be reflected in a change in procedures directly involving the visits, such as assessment, care planning, the monitoring of durable medical equipment, and discharge planning. Reducing administrative activities might involve curtailing supervisory review and quality assurance activities.

We do not observe any effect of the demonstration on referral procedures, intake procedures, assessment and care planning, the monitoring of durable medical equipment, discharge planning, quality-assurance procedures, or the handling of consumer feedback.

However, we do notice an apparent difference in referral sources; treatment agencies are more likely than control agencies to name hospitals as their most important referral source. All 11 agencies

in the treatment group indicated that hospitals are currently their most important referral source, compared with only 7 control agencies. This difference appears to predate the demonstration and does not appear to be an impact of per-visit rate setting.

It is hard to know at this stage of the demonstration whether this apparent difference in referral sources will have important implications for cost-control. A treatment-control difference in referral sources could be important because agencies for which hospitals are the most important referral source may face different competitive pressures and incentives than agencies where physicians or patients and families are the most important referral source. Also, a pre-existing difference in referral sources may imply a pre-existing difference in average patient acuity which would influence the number and costs of visits provided by an agency. We will continue to monitor this issue throughout the demonstration and will incorporate controls for any such differences into the quantitative impact analysis, if necessary.

RELATIONSHIPS BETWEEN THE AGENCIES AND THE DEMONSTRATION CONTRACTORS

As part of the case study, we asked about relations between the agencies and the various demonstration contractors: Blue Cross and Blue Shield of South Carolina, which is the fiscal intermediary of the demonstration; Abt Associates, Inc., which provides technical assistance and operational guidance, and Mathematica Policy Research, Inc. and the Bigel Institute for Health Policy at Brandeis University, which are conducting the evaluation.

In general, agencies reported smooth and positive relations with Blue Cross and Blue Shield of South Carolina, although a few serious problems were raised. Agencies generally recognize that Blue Cross and Blue Shield of South Carolina is able to process clean claims quickly and to pay clean claims promptly. However, some problems were reported with its procedures for handling problem claims and electronic claims submissions. Specifically, agency staff felt that the bill-error document and the associated summary report (the LIMO report) do not provide sufficiently specific information about problem claims to determine readily what is *not* being paid and why, thus complicating the correction and resubmission of claims and the monitoring and improvement of agency administrative procedures. Problems with the electronic submission of claims appear to have arisen largely as agencies that had been submitting electronic claims to their former fiscal intermediary began to submit such claims to Blue Cross Blue Shield of South Carolina. These problems were frustrating and expensive to resolve.

Some of the problems that were reported with the fiscal intermediary appear to stem from idiosyncratic aspects of the complex procedures for reviewing and processing home health claims in the early months of the demonstration. Over time, agency staff will learn to follow the procedures. However, deviation from them often meant that bills were not paid, and that the agency incurred the expense of reviewing the claim, identifying the error, and resubmitting the claim. The change in fiscal intermediaries under the demonstration appears to have disrupted established procedures (in ways that were not obvious to the demonstration fiscal intermediary or to the agencies at the time of the training) and to have required that agencies develop new working relationships with Blue Cross and Blue Shield of South Carolina.

The other major source of friction between the agencies and the fiscal intermediary is related to the processing of the patient-intake data form. In several instances, submitted forms did not appear to have been data entered at the fiscal intermediary, or appeared to have been data-entered long after they were submitted. In a considerable number of cases, agencies reported that data-entry

errors at the fiscal intermediary had led to failures to match patient-intake data forms with the associated 485 forms. Finally, the error reports provided to the agencies by the fiscal intermediary have often contained so many inaccuracies that they have created more problems than they have resolved. Some of these problems appear to reflect difficulties with data processing at BC/BS SC, and some problems appear to reflect misunderstandings between BC/BS SC and the agencies about BC/BS SC procedures for reporting errors and for updating and correcting claims. Nevertheless, these problems have greatly frustrated some agencies. At this time, the fiscal intermediary, HCFA, the demonstration contractor, and evaluation contractor are working to resolve these issues.

These problems have added significant first-year demonstration costs for some agencies. The added costs impair the ability of agencies to reduce costs by increasing efficiency. Thus, the first year of the demonstration might fail to produce an accurate picture of the extent to which per-visit rate setting can induce agencies to become more efficient. This type of situation is common in demonstration efforts that require changes in reporting practices. We expect that these problems will be addressed so that the experiences of the second and third years of the demonstration will be more representative of the long-term impact of prospective rate setting.

Agencies generally praised the staff of Abt for being informative, responsive, and attentive. In particular, the agencies credit the Abt project director with resolving a variety of problems with former fiscal intermediaries that would otherwise have prevented agencies from participating in the demonstration.

At the time of this initial round of case studies, the evaluation demands on the agencies have been minor. Thus, it is not surprising that agencies reported that, to date, the evaluation process has been "pretty painless."

A NATIONAL PROGRAM OF PER-VISIT PROSPECTIVE RATE SETTING

Although it is much too early to use the demonstration to make judgments about the desirability and shape of prospective-payment systems for home health, we thought it was useful to capture participants' initial impressions of how the per-visit prospective rate-setting system was working, and their views about the prospect of per-episode prospective payment. Because control agencies remain on cost-reimbursement, we asked these questions only of treatment agencies.

The directors of treatment agencies generally like the idea of a per-visit payment system. They feel that such a system will encourage efficiency, allow for better planning (because agencies will know in advance how much they will be paid for Medicare home health visits), and promote the financial health of agencies (because they will be able to raise capital more effectively). Despite this enthusiasm, some directors feel that a national system of per-visit payment will necessitate a case-mix adjustor in order to protect agencies from changes in the length of visits required by their mix of patients.

The agency directors whom we interviewed generally dislike the idea of a per-episode prospective payment system. Although several directors believe that per-episode prospective payments might spur efficiency further than per-visit payment, 9 of 11 treatment-agency directors feel that they will lose money under such a system. Most directors worry that per-episode payment will reduce the overall quality of care, because it would create incentives to cut services (as numerous agency staff perceive happened after changes in Medicare payment for hospitals and hospices were instituted). Agencies fear that, even if they themselves do not cut services, other agencies might do so, thus putting them

at a competitive disadvantage. Directors also noted that the per-episode system will be more complex and risky for home health agencies than per-visit payment, and that most home health agencies have only a limited capacity to absorb risk. If agencies are to enter into such a system voluntarily, the directors believe that HCFA will have to establish an accurate case-mix adjustment system, special rates for reimbursing the care provided to patients with extremely long or expensive episodes, and a cap on agency losses.

I. OVERVIEW OF THE DEMONSTRATION AND THE AGENCIES SELECTED FOR THE CASE STUDIES

The Health Care Financing Administration (HCFA) is undertaking the Home Health Prospective Payment Demonstration to test a major change in how home health agencies would be paid for their services to Medicare beneficiaries. Specifically, the demonstration is examining the extent to which the change from a cost-reimbursement payment system to a prospective rate-setting system will induce agencies to provide home health care more efficiently while maintaining the quality of the care and ensuring that Medicare beneficiaries continue to have access to care. A total of 49 home health agencies in California, Florida, Illinois, Massachusetts, and Texas entered the demonstration of ***per visit*** prospective rate setting beginning in October 1990. The per-visit demonstration will continue through December 1994; a demonstration of ***per episode*** prospective rate setting is planned to begin in 1993.

This report is the first in a series of case studies of home health agency administrative procedures and operations under the per-visit prospective rate-setting system. This report intends to:

- Describe the implementation of per-visit prospective rate setting in the demonstration
- Document major changes in the home health market during the course of the demonstration and assess their effects on the use and cost of Medicare home health services
- Compare the experiences of treatment and control agencies in order to help assess the impact of per-visit prospective rate setting
- Identify the administrative procedures and operations associated with success or failure at reducing administrative costs under per-visit prospective rate setting
- Assess how a national program of per-visit prospective rate setting would differ from the demonstration

To address these issues, we are conducting case studies of 22 of the 49 home health agencies that are participating in the demonstration.[1] These 22 agencies are a non-random, but broadly representative, subset of all of the demonstration agencies, and were selected to represent agencies with different characteristics and with different prospects for controlling costs under the per-visit prospective rate-setting system. We will use the case studies to monitor the 22 agencies over the three-year course of the demonstration and to collect information on the organization of the agencies, the types of services they provide, and their mix of payers, patterns of care, clinical costs, administrative costs, access to care, and quality of care. This information will be synthesized and combined with data from a survey of all 49 demonstration agencies in order to address the issues under investigation.

The information for these case studies comes primarily from interviews with staff at the 22 agencies and therefore reflects their perceptions and views. We spoke with the chief executive and financial officers, clinical supervisors, nurses and therapists in an effort to understand how the agencies perceived the demonstration, their markets, and their prospects for controlling costs and increasing efficiency. We also spoke with staff at HCFA, the demonstration contractor, and the demonstration fiscal intermediary in order to develop a more complete picture of demonstration operations. Finally, we reviewed the Medicare cost reports for the 22 agencies in order to measure their size and the extent to which they had grown in the year prior to the demonstration.

While a consistent picture tended to emerge from these various information sources, inconsistencies did arise. In fact, there were several instances where different respondents felt quite differently about aspects of demonstration operations. Since our main objective in this implementation analysis is to document and analyze how the agencies functioned in the demonstration, we have tended to focus on their perspectives when inconsistencies arose. It is these

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[1]Since this report was prepared, one agency has dropped out of the demonstration so that there are now only 48 agencies participating. Because this report seeks to describe the demonstration as it existed in late summer 1991, we have included all 49 agencies in our discussion. The agency that dropped out was not part of the subset of agencies studied in depth for this report.

perspectives that will shape agency behavior and responses to per-visit prospective rate setting. At the same time, we realize that agency perceptions may fail to capture the full story because of a lack of complete information or because of parochial views. Therefore, we have highlighted instances where we found major disagreements and tried to present the competing views accurately. Throughout the remainder of the implementation analysis and our subsequent reports we will continue to monitor these areas of disagreement and their implications for effective implementation of the demonstration and per-visit prospective rate setting.

This report, which analyzes the administrative procedures and operations of the demonstration agencies during the first year of demonstration operations, establishes the basis for understanding the agencies' structures and markets. The report also describes the agencies' early experiences under the demonstration. In the remainder of this chapter, we provide an overview of the demonstration and its evaluation and of the 22 home health agencies included in the case studies. Chapter II outlines the corporate and strategic plans of the 22 agencies, discussing the nature of the local home health markets, the agencies' growth plans, the mix of payers, and marketing strategies. Chapter III examines the patterns of care and how the agencies have responded to revisions in Medicare regulations. Chapter IV describes clinical services, the costs that agencies incur to provide these services, and the steps that agencies have taken to deliver the services more efficiently. Chapter V describes administrative procedures and costs, emphasizing the steps taken by agencies to control administrative costs and the demonstration-specific costs incurred by the agencies. Chapter VI examines how the agencies ensure that Medicare beneficiaries have access to needed care and how the agencies monitor and maintain the quality of that care. Chapter VII describes the training provided to agency staff, and the relationship between the projects, the fiscal intermediary, and the demonstration and evaluation contractors. Chapter VIII examines the broader issues surrounding decisions to adopt a national program of prospective payment.

A. THE HOME HEALTH PROSPECTIVE PAYMENT DEMONSTRATION

The demonstration tests a specific modification to Medicare home health policy. This modification, which would introduce per-visit prospective rate setting, continues a series of efforts to improve the efficiency with which home health agencies deliver care. In this section, we describe the Medicare home health care benefit and the ways in which the demonstration seeks to affect the delivery of this care. We also provide an overview of the demonstration operations and the evaluation. Participants in the operations activities include the 49 home health agencies; Abt Associates Inc. which provides technical assistance and operational guidance; HCFA; Blue Cross and Blue Shield of South Carolina, which is the fiscal intermediary of the demonstration; and the New England Research Institute, which will monitor the quality of care delivered by home health agencies in the demonstration. Mathematica Policy Research, Inc. and the Bigel Institute for Health Policy at Brandeis University are conducting the evaluation, which focuses on documenting the operations and assessing the impacts of the prospective rates on the agencies, their patients, and the Medicare budgets.

1. Medicare Home Health Care

Congress established the Medicare home health benefit as part of the original Medicare program and has modified the benefit many times, as it has the overall Medicare program. The current Medicare home health benefit covers home health services under both Part A and Part B, and neither a deductible nor coinsurance applies. To be eligible for Medicare home health care benefits, a beneficiary must have Medicare coverage, be homebound, be under the care of a physician, and need skilled nursing, physical therapy, or speech therapy.[2]

[2]Beneficiaries who need only occupational therapy are entitled to Medicare home health benefits only if they have established a prior need for skilled nursing care, speech therapy, or physical therapy in the current or prior certification period (Teplitsky and Janson, *Home Health & Hospice Manual*, 1991, p. VII.23; Section 204.4).

Approximately 5,730 Medicare-certified agencies provide home health care to Medicare beneficiaries (U.S. Department of Health and Human Services, 1991). Agencies can be reimbursed by Medicare for six types of visits: skilled nursing care, physical therapy, occupational therapy, speech therapy, medical social work, and home health aide services. Virtually all agencies offer skilled nursing care, physical therapy, and home health aide services to beneficiaries who need temporary acute care in their homes. Many agencies also provide occupational therapy, speech therapy, and medical social work services. Agencies operate under a variety of administrative structures, including proprietary, non-profit, hospital-based, and government-operated structures.

Outside of the prospective rate-setting demonstration, Medicare reimburses agencies for the reasonable costs incurred to provide care. Since July 1987, an agency's costs have been judged reasonable as long as they do not exceed 112 percent of the mean cost incurred by all agencies in the same geographic area (for hospital-based agencies, the cost limits for specific types of visits are from 13 percent to 16 percent higher than for free-standing agencies in recognition of the higher administrative and general costs incurred by hospital-based agencies). Agencies that incur costs in excess of these limits are reimbursed only up to the limits; agencies that incur costs below the limits receive reimbursements equal to their incurred costs.

Medicare expenditures for home health care have risen rapidly in recent years. HCFA estimates that Medicare home health spending will increase to $4.1 billion in fiscal year 1992, a 10 percent increase over the fiscal 1991 level, and a 64 percent increase over the fiscal 1989 level (U.S. House of Representatives, 1991).

2. Concepts and Issues of the Demonstration

The demonstration represents part of the response of HCFA to the growth in Medicare expenditures in general and to the dramatic growth in home health care expenditures in particular. The demonstration will assess an alternative to the present system of cost-reimbursement for Medicare-covered home health care services. Specifically, it will introduce prospective rate setting

for payment for home health care and will assess whether this new payment system induces home health agencies to provide care more efficiently. Under the demonstration, agencies will receive a fixed payment rate, set in advance, for each of the six basic types of home health care visits, regardless of the actual costs of the visits. Agencies that can provide care for less than the fixed rate will generate profits, or surpluses, whereas those whose costs increase above the fixed rate will incur losses. Thus, the prospective rates give agencies an incentive to provide services efficiently and to help hold down the costs of providing home health care to Medicare beneficiaries.

Prospective rates should enable agencies to predict their revenues more accurately than under the cost reimbursement system. With prospective rates, an agency knows that it will receive a specific amount for each visit, and that a cost-reimbursement review process will not disallow some costs. Prospective rates could also eliminate the need for annual audits of agency costs, thereby reducing administrative costs.

When agencies can generate a profit on any specific type of visit, the prospective rates create an incentive for the agency to increase the number of those types of visits. For those profitable visits, agencies might increase the number of visits per episode or the number of patients receiving the type of visit. An agency might also spread the treatments it had previously provided in one visit over two or more visits, a change that can increase both profits and quality (Case Note I.1).

To reduce their costs, agencies might intentionally or inadvertently reduce the quality of the care that they provide or might limit access to care. For example, they might rely on less expensive, less experienced staff, or might reduce the length or content of visits. They might also decline to admit patients whose treatments per visit are likely to be more expensive than the payment rate for the type of visit required. Thus, agencies might accept fewer cases that require extensive travel time, the services of more experienced or specially trained staff, or longer visits. Such changes would reduce the access to care for some Medicare beneficiaries, because patients with such special needs might find it difficult to identify an alternative source of services.

CASE NOTE I.1

MULTIPLE VISITS FOR PATIENT EDUCATION

Agency staff often mentioned that patient education is accomplished most effectively when divided into several short sessions, rather than delivered in one long session, particularly in the case of frail patients and their caregivers. Such patients and caregivers appear to absorb and retain information more completely when visiting staff provide instructions in short sessions. A series of short sessions reduces patient fatigue and provides an opportunity for visiting staff to reinforce material covered in previous sessions. Thus, agencies feel that they do a better job of teaching patients when they spread teaching activities across several visits; for example, caregivers are better able to help patients with specific exercises and patients are better able to follow complex medication regimens. This spreading might increase the number of visits provided to a patient (and raise total costs for the patient episode), but might also improve longer-term patient outcomes by ensuring that patients and informal caregivers have a complete grasp of the tasks and regimens associated with their care.

By operating and evaluating a system of per-visit prospective rate-setting, HCFA hopes to assess the net effect of these various incentives. HCFA expects that the prospective rates will induce agencies to become more efficient. To limit any negative effects of the system, the demonstration retains the Medicare claims-review process that monitors the appropriateness of visits, and will use an independent reviewer to monitor the quality of care. The evaluation will monitor the implementation of these various efforts and will assess the extent to which costs are controlled and access and quality are maintained.

3. Operations of the Demonstration

The demonstration will test the impacts of the per-visit prospective rates by implementing such a payment system for a sample of home health agencies in five states (California, Florida, Illinois, Massachusetts, and Texas). Prospective rates will be set for each agency on the basis of that agency's cost for the year immediately preceding the demonstration. At the end of each ensuing year of the demonstration, each agency's rates will be adjusted using the HCFA Market Basket inflation factor to reflect general changes in the wages of health care workers. The adjusted rates will then become the prospective rates for the following year. Participating agencies will be paid on this basis for three

years, after which they will return to the cost-reimbursement system, or to whatever system is in effect at the time.

In the demonstration, the agencies and HCFA share the potential risks and rewards of the prospective rate system. At the end of each year, HCFA will reimburse each agency for any losses greater than 5 percent of their Medicare allowable costs of providing the prospectively paid services. For agencies that generate a profit, HCFA will share in any profits greater than 5 percent of allowable Medicare costs.[3] The demonstration also contains a mechanism to adjust the rates to reflect economies of scale. To reflect the fact that administrative costs per unit of services should fall as volume increases, this mechanism will decrease rates by 1 percent for every 10 percent increase in the number of Medicare visits. Correspondingly, to reflect the loss of economies of scale, the mechanism will increase rates by 1 percent for every 10 percent decrease in Medicare visits.

A total of 49 agencies are participating in the demonstration. Forty-three are located in urban areas, and 6 are located in rural areas. The rural sites, which are in Illinois and Texas, were included in the demonstration to examine the effect of the prospective rates on agencies that operate in nonurban settings. In particular, there is concern that rural agencies will face high transportation costs for delivering home health care, and that they might find it very difficult to recruit and retain staff.

The demonstration includes procedures to counteract the incentives that agencies might have to increase inappropriately the number of visits or to compromise the quality of care. The number of visits is controlled through the medical reviews conducted by the fiscal intermediary. As under cost-reimbursement, the fiscal intermediary will select a sample of cases and review the appropriateness of the visits. If a visit is deemed to have been unnecessary, the visit will be denied.

[3]HCFA will recover 25 percent of any profits between 5 percent and 15 percent of allowable Medicare costs. HCFA will recover 50 percent of profits in excess of 15 percent and up to 20 percent of costs in the first year of the demonstration, up to 25 percent of costs in the second year, and up to 30 percent of costs in the third year. All profits in excess of these levels will be recovered by HCFA.

If visits are denied for less than 2.5 percent of an agency's claims, then all visits (including those denied) will be paid under a waiver-of-liability procedure established by HCFA. However, if visits are denied for more than this amount, then the agency will not be paid for denied claims. The demonstration seeks to maintain the quality of care by having an independent organization, the New England Research Institute, review a sample of cases from each agency to determine the quality of care. Agencies for which quality problems are identified will be provided with education, and instances of flagrant problems will be referred to HCFA.

Because the demonstration is a temporary test of per-visit prospective rate setting, it differs from a permanent program in several potentially important ways. First, the demonstration will last for only three years, after which agencies expect to return to the current cost-reimbursement system. Due to the temporary nature of the program, agencies might be reluctant to make structural changes that would create efficiencies in their operations but that would be irrelevant under the cost-reimbursement system. For example, agencies might be reluctant to merge with other agencies in order to achieve a more efficient scale. Second, because the Medicare home health care market is quite competitive, and because agencies typically compete in terms of the quality and convenience of care, agencies might be reluctant to take any actions that might be perceived as reducing the quality or convenience of their care. This competition between the agencies will inhibit any egregious efforts to cut quality by demonstration agencies. Third, the demonstration introduced a patient-intake form that is used to collect information about the characteristics of patients served by the demonstration agencies. Although this form is relatively simple, it does require agencies to expend resources on a task that would not be part of an ongoing program. Fourth, because the demonstration uses a single fiscal intermediary, all of the agencies had to switch from their former fiscal intermediaries to Blue Cross/Blue Shield of South Carolina for the course of the demonstration. This switch involved change-over costs, including those associated with learning new procedures and, in some cases, with adapting billing systems to conform to the procedures of the new intermediary.

Although these costs were temporary, they might have constituted a substantial fraction of the revenue-cost margin under which some agencies operate.

4. Components and Methods of the Evaluation

The evaluation consists of two interrelated inquiries: (1) estimating the impacts of the conversion to per-visit prospective rate setting, and (2) documenting and analyzing the implementation of this prospective rate setting and its effects on the operation of the agencies, the fiscal intermediaries, and the Medicare program.[4] These two areas of inquiry are interrelated, as impacts can be interpreted only in light of how prospective rate setting was implemented in the demonstration and the context in which the demonstration operated. In addition, to focus the implementation analysis on agencies that were particularly successful or particularly unsuccessful at improving efficiency, we need to know the nature and extent of the impacts of the program.

The ***impact analysis*** examines the extent to which the change from a cost-reimbursement system to the per-visit prospective rate-setting system leads to changes in the Medicare program, the participating home health agencies, and their patients.[5] In estimating the extent of these changes, the impact analysis will examine:

- Average cost per visit
- Utilization of home health services
- Use of and expenditures for Medicare services
- Costs and revenues of agencies
- Use of non-Medicare covered services

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[4]In addition to these two goals, which focus on the impact of the per-visit prospective rate system, the evaluation effort also will examine the effects of patient-classification methods on home health agency payments. This area of investigation will develop methods for adjusting per-episode rates to reflect differences in the mix of cases served by agencies. These case-mix adjusters will be incorporated into a planned future demonstration that will examine the impacts of a per-episode prospective rate system.

[5]The various elements in the impact analysis (and other evaluation activities) are presented in a separate design report (Brown et al., 1991).

- Selection and retention of patients
- Quality of care

At the heart of the impact evaluation is the random assignment of participating agencies to either a treatment group (which is paid the per-visit rates) or a control group (which continues to be paid under the current cost-reimbursement system). At the time of random assignment, the two groups are essentially identical; thus, differences that emerge over the course of the demonstration can be attributed to per-visit rate-setting with a known degree of statistical precision. We will use numerous data sources to measure the impacts. The sources include claims data for Medicare beneficiaries served by the demonstration agencies, patient data collected in the Patient Intake Data Form and in surveys, and agency-specific information collected in a survey of agencies and from the Medicare cost reports of the agencies.

To interpret and generalize the impact findings, the evaluation includes a second component, which examines ***program implementation and operations***. This implementation analysis, of which this report is a part, will focus on documenting the operations of the demonstration and the context in which the demonstration operated. The implementation analysis will generate information on how and why home health agencies change their procedures, both in general and in terms of (1) their relationships with other home health agencies and with the fiscal intermediary, (2) their marketing efforts and relationships with patient-referral sources, and (3) their hiring, training, supervision, and quality- assurance procedures. In addition, we will focus on the methods by which agencies cut costs in order to assess whether the cost-cutting steps taken by agencies are likely to affect the quality of care or access to care adversely. The implementation analysis will also examine the pattern of participation and nonparticipation among agencies invited into the demonstration. This examination will enable us to assess the generalizability of the evaluation results, as well as to improve our understanding of the risks that agencies perceive in prospective payment and the extent to which perceptions vary among different types of home health agencies. Finally, the implementation analysis

will address the administrative burden of the demonstration on home health agencies and fiscal intermediaries, paying particular attention to the reporting and auditing costs required by the per-visit rate-setting demonstration that would not be required in a national program. These demonstration-specific costs must be factored into any conclusions about the costs of prospective payment.

A series of case studies lies at the heart of the implementation analysis. The initial findings of these case studies, which we present in this report, incorporate information that we collected through a series of interviews with staff at 11 treatment agencies and 11 control agencies. We interviewed staff at treatment agencies in-person during a series of site visits and interviewed staff at the control agencies over the telephone. During this process, which was conducted between July 1991 and October 1991, we talked to chief executive officers, chief financial officers, clinical supervisors, and nurses and therapists of treatment agencies, and to chief executive officers of control agencies. We collected information about the structures of agencies, the delivery of care, plans for growth, quality-assurance procedures, and costs to agencies. To collect consistent information from all sites, we used a standardized interview protocol for both the in-person and telephone interviews. However, we included only a subset of the protocol questions in the telephone interviews, in order to limit the telephone conversations to a manageable length and to minimize the burden on the agencies in the control group.

Our goal in conducting these interviews is to develop a more complete understanding of the agencies participating in the demonstration, the operation of the demonstration, and the context in which the demonstration was implemented. This is largely a descriptive analysis, with an emphasis on documenting the activities that will be evaluated quantitatively in the impact analysis. In this background report, our interest lies primarily in the following types of issues:

- Are there differences between treatment and control agencies that pre-date the demonstration[6]

- How do agencies perceive the demonstration and the incentives of per-visit prospective rate setting?

- Was the demonstration implemented as designed?

- Will the demonstration serve as a sound basis for making judgments about a national program of per-visit prospective rate setting?

- Do we observe agency characteristics or actions that suggest hypotheses about the mechanisms that underlie any observed demonstration impacts?

In pursuing these objectives, we will make frequent mention of treatment-control differences. Our purpose in noting these apparent differences is to document any possible factors that might help explain why certain patterns emerge in the subsequent impact analysis. We are not seeking in this report to determine the effect of the switch to prospective rate setting.

Even with respect to our goal of documenting demonstration operations and the methods by which agencies seek to control costs and increase efficiency, we are limited by data and methods. Specifically, the limited number of observations and, to a lesser extent, the different methods of collecting information from treatment agencies and control agencies, limit the findings derived from this case study. With data on only 22 agencies, it is unlikely that we will be able to distinguish accurately between the numerous factors that influence costs, quality, and access, regardless of the level of detail in the information. Furthermore, although we expect using different interviewing methods (in-person visits and telephone interviews) to ask staff of treatment and control agencies the same direct questions will have little or no effect, we might observe seemingly apparent differences

[6]The random assignment of agencies to the prospective payment and cost-reimbursement groups should produce groups that are equivalent at the beginning of the demonstration. Nevertheless, it is possible that the two groups of agencies will differ by chance, particularly since only 49 agencies were randomly assigned. The process analysis will therefore document any apparent differences between the two sets of agencies that might influence agency costs, cost control efforts, quality of care, or access to care.

between treatment and control agencies, which are artifacts of the less-extensive information available on control agencies. When interpreting our results, we will consider the possibility of such artifacts.

Within the limitations of the available data, we have sought to identify the major characteristics of home health agencies and the principal ways in which the agencies respond to the incentives of prospective payment in the early months of the demonstration. We have also drawn on our experience with other agencies, including other home health agencies and other health and social service agencies, to provide a context for interpreting what we have learned from the interviews with staff at demonstration agencies. Finally, we reviewed the Medicare cost reports of the agencies in order to collect quantitative information about growth rates, the fraction of agency visits covered by Medicare, and past revenue and cost experiences.

B. CHARACTERISTICS OF THE AGENCIES IN THE DEMONSTRATION

The 22 home health agencies included in the case study represent a broad mix of agencies. We selected these 22 agencies judgmentally to represent the general mix of characteristics, environments, and capacities of the 49 agencies participating in the demonstration. Because the case-study sample is not statistically representative of the overall set of demonstration agencies, we have been careful when generalizing from the case studies. Our research indicates what types of successes and problems the demonstration agencies are having. However, until we obtain data on all agencies in the demonstration, the case-study results should not be interpreted as representing the experience of the demonstration as a whole.

The 22 case-study agencies come from all five demonstration states (Figure I.1). Most are located in urban areas. We selected four urban agencies (two treatment agencies and two control agencies) from both California and Massachusetts. We selected two urban agencies (one treatment agency and one control agency) from Florida, because Florida had only four demonstration agencies

when we selected case-study agencies.[7] Six agencies (four urban agencies and two rural agencies, evenly split between the treatment and control groups) were selected from both Texas and Illinois, the only demonstration states in which the demonstration included rural areas.

The agencies also reflect a mix of other key characteristics. A brief review of the descriptive statistics pertaining to the case-study agencies (Table I.1) shows that the case-study agencies operate under a mix of auspices (hospital-based, proprietary, and non-profit), although relatively few belong to a chain.[8] Most of the agencies provide fewer than 15,500 home health visits per year, and all but one have grown over the last year. Medicare is the major payer for most of the agencies, and most of the agencies face competition in the form of other Medicare-certified agencies that operate in their counties. Beyond this overview, a considerable level of additional variation between the agencies exists, as illustrated by the fact that:

- The largest agency provided more than 240,000 visits in fiscal year 1990 (including Medicare and non-Medicare visits), whereas the second largest provided approximately 41,000 visits. The smallest agency provided only 122 visits.
- Medicare paid for most of the visits provided by most of the agencies, although, for one agency, less than 20 percent of the visits were covered by Medicare.
- Three of the five hospital-based agencies were located in rural areas.
- Between fiscal year 1989 and 1991, the 22 agencies grew by an average of 32 percent in terms of the number of Medicare visits provided. However, the fastest growing agency increased its visits by more than 140 percent, whereas one agency had a decline of 95 percent.
- Four of the 22 agencies were over the Medicare cost limits in fiscal year 1990; three of the four were over by more than 10 percent.

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[7]We selected the case study agencies in June 1991, at which time 42 agencies had enrolled in the demonstration.

[8]All but one of the seven chains participating in the demonstration are represented in the case-study sample. We tried to limit the burden on those chains with several agencies participating in the demonstration by selecting, at most, one agency from the chain for the case study. The only exception to this rule was made for one chain from which two agencies were included in the case study. This exception was made because the inclusion of both agencies from that chain helped us ensure a reasonable geographic mix for the case-study agencies.

FIGURE I.1

CITIES WITH AGENCIES INCLUDED IN THE CASE STUDY ANALYSIS

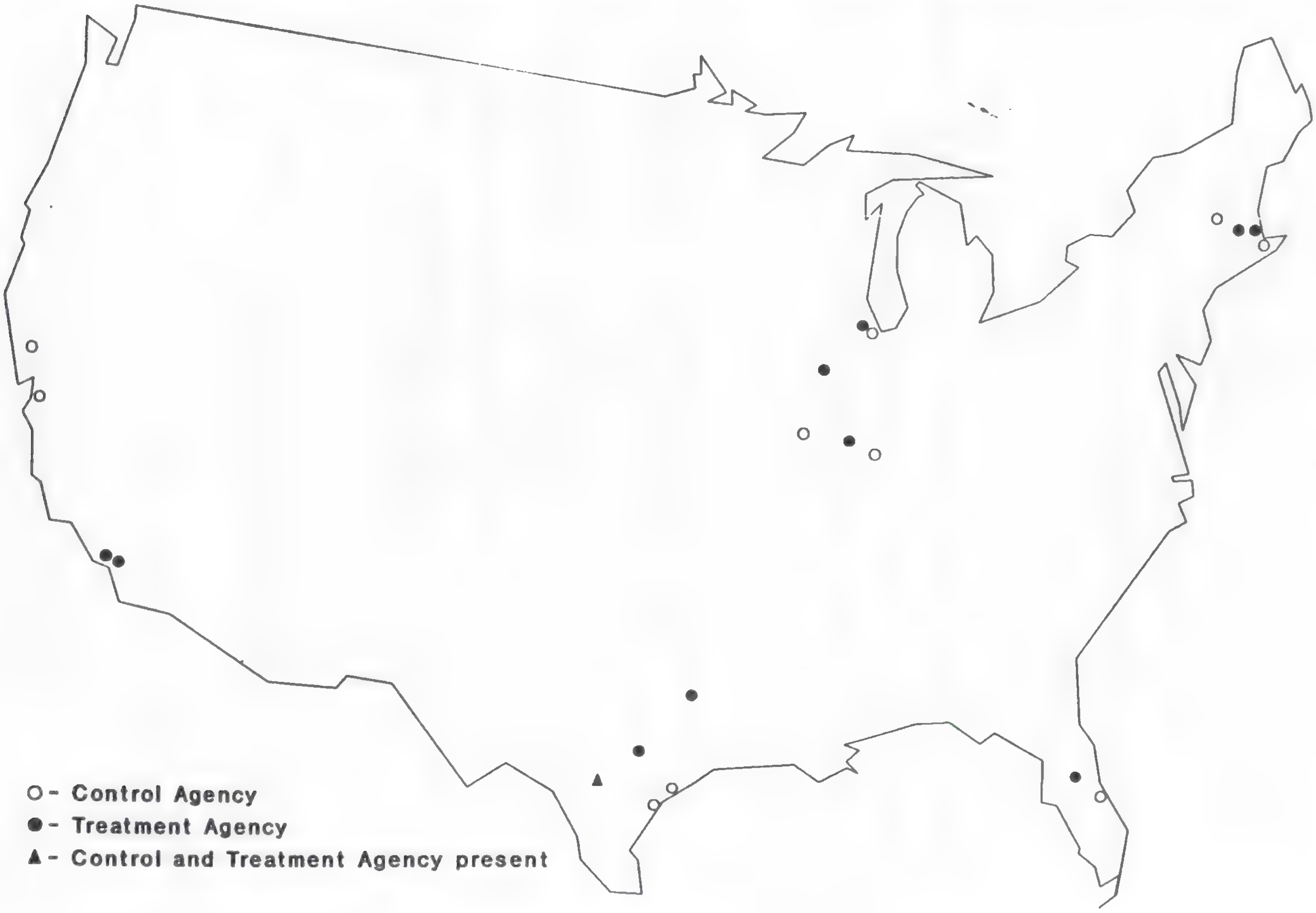

TABLE I.1

CHARACTERISTICS OF DEMONSTRATION AND CASE-STUDY AGENCIES

	Case-Study Agencies		All Demonstration Agencies	
Characteristic	Number	Percent	Number	Percent
Number of Agencies	22	100%	49	100%
Treatment Status				
Prospective-payment	11	50%	27	55%
Cost-reimbursement	11	50%	22	45%
State				
California	4	18%	10	20%
Florida	2	9%	6	12%
Illinois	6	27%	9	18%
Massachusetts	4	18%	6	12%
Texas	6	27%	18	36%
Auspice[a]				
Hospital-based	5	23%	7	14%
Proprietary	8	36%	28	57%
Non-profit	9	41%	14	29%
Chain Membership				
Yes	6	27%	14	29%
No	16	73%	35	71%
Urban/Rural Location				
Urban	18	82%	43	88%
Rural	4	18%	6	12%
Number of Medicare Visits in 1989[b]				
3,500 or fewer	7	32%	11	22%
3,501 to 7,000	3	14%	7	14%
7,001 to 15,500	8	36%	16	33%
More than 15,500	4	18%	14	29%
Missing	0	0%	1	2%
Percentage Growth in Annual Medicare Visits (1989 to 1990)[b]				
Decline	2	9%	5	10%
0 to 20 percent	4	18%	6	12%
21 to 50 percent	4	18%	9	18%
51 to 100 percent	8	36%	11	22%
More than 100 percent	3	14%	5	10%
Missing	1	5%	13	27%

TABLE I.1 (continued)

Characteristic	Case-Study Agencies		All Demonstration Agencies	
	Number	Percent	Number	Percent
Percent of Visits Covered by Medicare (1990)[b]				
1 to 50 percent	3	14%	5	10%
51 to 70 percent	3	14%	4	8%
71 to 90 percent	6	27%	7	14%
91 to 100 percent	10	46%	25	51%
Missing	0	0%	8	16%

SOURCE: Agency Medicare cost reports for fiscal years 1989 and 1990.

[a]The auspice of each agency was determined from the HCFA Provider of Service file by Abt Associates, the demonstration contractor (Goldberg, 1991), and the figures in the table are based on that classification. At least one of the agencies classified as proprietary is owned by a holding company that also owns a hospital. Thus, the auspice classification might fail to indicate the full extent to which agencies are linked to hospitals.

[b]At the time that this report was prepared, we lacked complete Medicare cost reports from fiscal years 1989 and 1990 for 13 agencies. When a particular characteristic could not be calculated for an agency, we have included that agency in the missing category.

These characteristics suggest that, when assessing the potential impact of the demonstration system of prospective rate setting, it will be important to keep three factors in mind: (1) the fraction of visits covered by Medicare, (2) the number of agencies whose costs exceeded the Medicare cost limits, and (3) the interaction between agency growth rates and the volume adjuster. The effect of prospective rate setting is likely to be dampened for agencies that receive a substantial fraction of their revenues from sources other than Medicare. Similarly, it will be difficult to isolate the effect of rate setting for agencies whose costs exceed the limits; in such cases, the incentives of the prospective rates do not differ substantially from the incentives of the current system. Under either system, agencies whose aggregate costs exceed the limits will incur losses and thus have an incentive to cut costs. Finally, all but 3 of the 22 case-study agencies will have their payment rates cut under the demonstration volume adjustor if they continue to grow at the rates observed from 1989 to 1990. During that year, one-half of the agencies grew by more than 50 percent, and thus would have faced rate cuts of the maximum 5 percent, had that year been covered by the demonstration.

Overall, the case-study agencies reflect the full sample of 49 agencies in the demonstration, although it is not statistically representative of the full demonstration sample because we selected the case-study sample judgmentally. The case-study sample contains a representative mix of agencies in terms of auspice, urban or rural location, and treatment or control status. Furthermore, the case-study sample represents all of the extremes in terms of size, growth, and the percent of visits covered by Medicare. However, because it includes all the extremes, the case-study sample tends to overrepresent those types of agencies that are relatively less numerous in the demonstration, and to underrepresent those that are relatively more numerous. For example, more demonstration agencies are located in Texas than in any other state (36 percent of the 49 agencies are located in Texas), but, in the case-study sample, Texas and Illinois have an equal number of agencies. Similarly, the case-study sample slightly underrepresents proprietary agencies, agencies with more than 15,500 visit per

year, agencies that have grown by more than 50 percent, and agencies for which more than 90 percent of the visits are paid for by Medicare.

Before proceeding with the case study analysis, it is essential to note that the groups of treatment and control agencies included in the case study generally resemble each other, although the case-study treatment agencies, on average, appear to be slightly larger, to have grown slightly less, and to have a slightly lower fraction of visits covered by Medicare (Table I.2). Specifically:

- The distribution of case-study treatment and control agencies with respect to state, auspice, chain membership, and urban or rural location are essentially identical.
- The case-study treatment sample contains more very large agencies (that is, agencies that provide more than 15,500 visits per year) than does the control sample. This difference is also seen in the difference between the median number of visits for treatment and control agencies (12,594 for the treatment agencies and 9,992 for the control agencies)
- The case-study treatment sample contains fewer high-growth agencies (those that increased their annual number of Medicare visits by 50 percent or more from 1989 to 1990) than does the control sample.
- The case-study treatment sample contains fewer agencies for which Medicare pays for more than 90 percent of the visits than does the control sample; Medicare paid for more than 90 percent of the visits in three treatment agencies and in seven control agencies.

Although these differences are not substantial, they might influence some of the activities on which we focus in the case study. For example, the differences in prior growth rates might lead to subsequent differences in growth or strategic plans during the demonstration. Thus, when assessing any observed differences in the case studies, we have tried to determine whether the difference was affected by the per-visit prospective rate-setting system of the demonstration, or whether it is the result of the pre-existing differences between treatment and control agencies.

TABLE I.2

COMPARISON OF TREATMENT AND CONTROL AGENCIES
FOR THE CASE-STUDY SAMPLE
(Number of Agencies with Characteristic)

Characteristic	Treatment Agencies	Control Agencies
Number of Agencies	11	11
State		
California	2	2
Florida	1	1
Illinois	3	3
Massachusetts	2	2
Texas	3	3
Auspice		
Hospital-based	3	2
Proprietary	4	4
Non-profit	4	5
Chain Membership		
Yes	8	8
No	3	3
Urban/Rural Location		
Urban	9	9
Rural	2	2
Number of Medicare Visits in 1990		
3,500 or fewer	3	4
3,501 to 7,000	2	0
7,001 to 15,500	1	5
More than 15,500	5	2
Median	12,594	9,992
Percentage Growth in Annual Medicare Visits (1989 to 1990)		
Decline	1	1
0 to 20 percent	3	1
21 to 50 percent	2	2
51 to 100 percent	2	6
More than 100 percent	2	1
Missing	1	0
Median	30 %	55 %

TABLE I.2 (continued)

Characteristic	Treatment Agencies	Control Agencies
Percent of Visits Covered by Medicare (1990)		
1 to 50 percent	2	1
51 to 70 percent	2	1
71 to 90 percent	4	2
91 to 100 percent	3	7

Source: Agency Medicare costs reports for fiscal years 1989 and 1990.

II. CORPORATE AND STRATEGIC PLANNING

Key to interpreting the performance of home health agencies participating in the demonstration is understanding how the agencies view and are trying to respond to their environments. The environments comprise not only the incentives and requirements of the demonstration, but also the ongoing changes in the industry and the local market forces that each agency faces. Furthermore, each agency works within an organizational context that is shaped by the agency's mission and by the goals of any related organizational entities.

This chapter addresses these and other issues related to corporate and strategic planning. It attempts to determine whether the intervention is affecting corporate and strategic planning and, if so, in what way. The chapter discusses:

- The marketing strategies of the agencies, and whether and how the agencies plan to grow
- The services offered by the Medicare-certified agencies and related organizations, and whether the service mix is changing
- The mix of payers for agency services, and the staff's views of the desirability of various payers
- The geographic areas served by the agencies, and whether the served areas are changing

The analysis characterizes the patterns and range of agency behavior, looks for differences between control agencies and treatment agencies, and looks for differences among agencies of different sizes, auspices, and urban or rural location.[1]

Generally, the strategic plans of the 22 agencies have some similarities across all types of agencies, but we observe that larger agencies seem to differ slightly from smaller agencies. The stated

[1]After demonstration agencies gain more experience under the demonstration, and the facility survey has been completed, we will examine in a subsequent report additional corporate and strategic planning issues, notably capital expenses and the impacts of changes in corporate and strategic planning on profits.

goals of all agencies, regardless of type, are to grow to meet community needs, to fulfill their service missions, and to become more efficient. In their strategic plans, three of the six hospital-affiliated agencies also mentioned serving the hospitals' needs (for example, to improve cash flow, to help to move patients out of the hospital, and to bring hospital services to the community). One difference was that the larger agencies are more likely than the smaller ones to have formal, written strategic plans. Seven of the 9 agencies with formal plans provide at least 13,000 Medicare-covered visits per year, whereas only 3 of the 13 without formal plans do so. For-profit and not-for-profit agencies are equally likely to have formal strategic plans.

Through their strategic plans (whether formal or informal), agencies express the need to balance their desire to serve their communities with that of remaining financially viable, or, as one senior executive put it, to "balance the mission with the margin." Fifteen of the 22 agencies, including 6 of the 8 for-profit agencies, list service to their communities as a main goal. Six agencies also indicate a desire to care for all patients, regardless of the patients' ability to pay. At the same time, directors indicate that they must promote efficiency in order to survive and to continue serving their communities. Indeed, agency survival is a dominant theme in many plans. Directors speak of the need for constant attention to maintaining efficiency, recruiting and retaining staff, offering ever more highly skilled services, looking for new referral sources while maintaining old ones, refining paperwork systems, keeping up with changes in payer requirements, and other survival-enhancing activities.

The strategic plans all indicate the competitive and dynamic nature of the home-health industry and the extent to which the smaller independent agencies in large markets feel especially beleaguered. The small agencies have a flat management structure (typically comprising an executive director, a clinical director, and a part-time financial manager, below whom are the visiting staff). Small agencies successfully compete against chains or large urban agencies, which typically have more highly trained and specialized staff in the areas of marketing, quality assurance, and financial management. However, small agencies do so with difficulty, and only by paying strict attention to all

aspects of their operations. Although the smaller agencies often lack the capital and personnel to develop extensive and complex strategic plans, most of the administrators understand the incentives and operation of the prospective rate-setting system and try to take advantage of the financial opportunities associated with it. Whether they can succeed remains to be seen.

A. MARKETING STRATEGIES

Home health is an increasingly competitive industry, and agencies must actively market their services in order to survive. Market-entry costs are relatively low, and the threat that large chains will enter almost any market is constant. Furthermore, hospitals continue to expand into the home health market. For many agencies, the entrance of a local hospital into the home health market is a double-edged sword: the change introduces a rival agency and, as the hospital channels its patients who need home health care to its own agency, reduces referrals, as well.

We hypothesized that agencies might respond to prospective rates by developing new markets while maintaining old ones. Per-visit rates are fixed under the demonstration. Therefore, increased volume allows agencies to spread their overhead over a greater number of visits, and it is possible for agencies to generate larger profits by increasing volume. Moreover, under the demonstration, agencies can use retained surpluses explicitly for marketing purposes, in order to expand further. Strategies to expand markets and market share include advertising, developing new contracts with HMOs, and improving agency informational materials. Costs for such marketing activities would be disallowed under the regular Medicare cost-reimbursement system.

All 22 agencies reported that their markets are competitive. Fifteen consider their markets to be "highly competitive," and 7 consider them "somewhat competitive." No agency considers its market to be "not at all competitive." We find no apparent difference between treatment agencies and control agencies with respect to perceived competitiveness. Not surprisingly, urban areas appear to be more competitive than rural areas; 3 of the 4 rural home health agencies perceive their markets to be "somewhat competitive," compared with only 4 of 18 urban agencies.

All 22 agencies expect to grow during the next three years. Ten expect to grow "a lot," and 12 expect to grow "a little." Expectations about growth seem to be tied to previous growth rates.[2] The 10 agencies that expect to grow a lot had grown by an average of 60 percent between fiscal years 1989 and 1990, whereas the 12 agencies with lower expectations had grown by an average of 20 percent. Given this correlation, and the fact that more control agencies than treatment agencies had grown rapidly in the last year (5 of 11 control agencies had grown by more than 50 percent, compared with 3 of 11 treatment agencies), it is not surprising that control agencies are somewhat more likely than treatment agencies to report expecting to grow a lot (6 of 11, versus 4 of 11). Of course, the imprecision of the terms "a little" and "a lot" might mask substantial variation in directors' plans. For example, the directors of the two agencies that had grown by more than 70 percent in the last year, and the directors of the two that had grown by about 7 percent, all expect to grow "a little." Nevertheless, it seems likely that the directors in the former agencies have a different idea of growth than those in the latter.

What makes agencies want to grow? The most frequently cited reasons relate to meeting the needs of their communities (ten agencies), needing to grow in order to survive (four agencies), hoping to achieve economies of scale (three agencies), doing a better job by training or acquiring staff (four agencies), and increasing profits (two for-profit agencies).

What stands in the way of growth? Seven of the 21 agencies responding to this question stated that nothing stands in the way of growth. The remaining 14 agencies cited a variety of external and internal factors that inhibit growth. The external factors include competition, especially from hospitals (seven agencies), shortages of professional staff (four agencies), shortages of capital or inadequate cash flow (four agencies), and fears that the fiscal intermediary will deny claims (two agencies). No agency cited the state certificate-of-need requirements as a barrier to growth. Internal factors include difficulties in managing and supervising staff in a larger organization (six large agencies

[2]No differences in growth expectations by size, auspice, or urban/rural location were apparent.

in the treatment group), staff fatigue induced by growth (two agencies), a desire to maintain the personal relationships of a small agency (three agencies), and a desire to preserve a small-agency or town-oriented image (three agencies). Only smaller agencies cited the last two factors.

The capacity of the agencies to provide needed visits or to serve new cases does not seem to limit growth. In our interviews, the case-study agencies indicated that they rarely miss visits due to a lack of staff, or turn away new patients because of capacity or funding problems. Of the 18 agencies responding, 9 reported never missing a visit or turning away new patients because of capacity problems, 5 reported doing so rarely, and only 4 reported occasionally being unable to serve new patients. In part, this responsiveness reflects the priority that agencies give to satisfying their referral sources and patients, as well as the agencies' use of on-call and part-time staff to meet peaks in demand. In those instances in which agency capacity presents a problem, the most common cause is a temporary shortage of physical therapists or high-tech care providers (for example, enterostomal therapists, infusion therapists, or pediatric care staff). Agencies might have difficulty meeting peaks in demand for these specialized types of care, as agencies are reluctant to maintain excess staff in specialized positions for which the demand is sporadic and the cost of down time is high. One agency solved this problem by training its nurses to provide some high-tech care; the nurses can continue to provide regular skilled-nursing visits when their specialized care is not needed.

Virtually all of the agencies (21 of 22) reported undertaking, or having firm plans to undertake, specific initiatives to expand or maintain their markets. Only one very small hospital-based rural agency has no such plan. Twelve agencies plan to add new services, including infusion therapy (four agencies), pediatric care (three agencies), hospice care (two agencies), private duty nursing, maternal care to high-risk mothers, rehabilitation nursing, psychiatric nursing, and oncology. Seven of the 12 agencies are in the treatment group, and five are in the control group. Eight agencies plan to improve relationships with referral sources, most commonly with physicians, and six plan to develop

new referral sources. Four agencies plan to increase or improve advertising or public relations, and four plan to enter new geographic areas.

B. SERVICES PROVIDED IN MEDICARE-CERTIFIED AGENCIES AND IN RELATED ENTITIES

Agencies participating in the demonstration face incentives both to expand and to contract the types of services provided through their Medicare-certified agencies and their related entities. The tension between these conflicting incentives is likely to continue throughout the course of the demonstration. However, at this early stage, it appears that, on balance, agencies in the treatment group are expanding services slightly relative to the control agencies.

Two strong incentives to expand, which influence both treatment agencies and control agencies, are the rapid growth rates of and the high level of competition among home health agencies. In order to grow or to meet the challenge of competition, agencies need to respond to the needs of their referral sources and, when possible, to find new referral sources. Expanding the services provided can help in these efforts by increasing the extent to which an agency can meet the full spectrum of a referral source's demands. In addition, agencies might add services as they pursue their missions of serving their communities.

Agencies in the treatment group have an additional incentive to expand the types of provided services. The prospective-rate system, unlike the cost-reimbursement system, does not require agencies to allocate administrative costs proportionally to all visits, regardless of whether the visits are paid for by Medicare. Thus, agencies (especially those in which administrative costs for Medicare visits are disproportionately high) have a greater incentive to expand non-Medicare services under the prospective-rate system than under the cost-reimbursement system. The volume adjusters of the demonstration, which are based only on Medicare visits, reinforce this incentive. Thus, by providing more non-Medicare services, treatment agencies might benefit from economies of scale arising from higher total volume without having their Medicare prospective rates reduced by the volume adjusters.

The demonstration also gives treatment agencies an incentive to drop or reduce some of the optional Medicare home health services (that is, physical therapy, speech pathology, occupational therapy, and Medicare social service) if the agencies are not earning profits on those services.[3] If visits for infusion therapy tend to be longer than average, thus resulting in higher costs, treatment agencies have an incentive to drop the therapy or to transfer it to a related entity. Finally, treatment agencies that provide durable medical equipment (DME) might have an incentive to drop this service and to have an external organization provide DME. The incentive to drop direct provision of DME stems from the fact that, although Medicare reimburses the costs of the DME, it makes no provision for reimbursing any extra administrative costs specifically associated with providing DME. Thus, agencies might want to rid themselves of those administrative costs by having an external organization provide the DME. Agencies in both the treatment and the control groups might also want to stop providing DME because the rapid technological and regulatory changes in and increasing costs of medical technology reduce the profitability of this service.

On balance, the various incentives seem to be leading treatment agencies to expand services outside the Medicare-certified agency, although the effect currently appears small. Both treatment agencies and control agencies tend to provide the full range of Medicare services within their Medicare-certified agencies. Our overall assessment, after the first round of case-study visits, is that:

- Treatment agencies and control agencies do not differ substantially with respect to the services offered in their certified agencies. Eight of 11 control agencies and 10 of 11 treatment agencies offer all six of the Medicare home health services.

- Treatment agencies are not dropping the optional Medicare services.

- Treatment agencies and control agencies have not differentially changed Medicare services within the Medicare-certified agencies since joining the demonstration. Two control agencies added services (hospice care and infusion), as did two of the treatment agencies (DME and hospice care).

[3]To meet the Medicare conditions of participation, an agency must offer visits by skilled nurses and home health aides.

- The treatment agencies are slightly more likely to offer services through related entities. Seven of 11 treatment agencies and four of 11 control agencies do so (these services exclude hospital services provided through the hospitals of hospital-based agencies).

- Agencies have not changed the services delivered in related entities since the beginning of the demonstration.

Although the treatment agencies and control agencies offer substantially similar services (particularly with respect to the six basic Medicare home health services), there are a few emerging differences with respect to infusion therapy and hospice care. These differences are currently small, but, if the apparent trends continue, they might grow sufficiently to warrant careful attention in the evaluation. The potential difference with infusion care is the largest. Prior to joining the demonstration, three treatment agencies and no control agencies provided infusion therapy. Since the demonstration began, one treatment agency has added infusion therapy, and another plans to add it; only one control agency plans to add this service. The difference with respect to hospice care is somewhat smaller. Prior to joining the demonstration, two treatment agencies and two control agencies provided hospice care. However, treatment agencies subsequently seem to be more inclined to add hospice services; at the time of our case-study interviews, three treatment agencies and no control agencies plan to add hospice services. We will continue to monitor these two trends throughout the demonstration.

C. MIX OF PAYERS

We had two primary hypotheses concerning payment for services: (1) that the currently low rate of contracts between Medicare-certified home health agencies and HMOs was unlikely to change (because HMOs cannot sufficiently control utilization and because certified home health agencies cannot offer discounts), and (2) that the mix of private and Medicaid patients served in the Medicare-certified agencies would not change (because the demonstration would not alter many of the Medicare regulations, such as those pertaining to quality assurance, that can lead agencies to limit

the extent to which they serve non-Medicare patients in their Medicare-certified agencies and because agency executives might be reluctant to make major changes in their mix of payers in response to the three-year demonstration). To some extent, the demonstration might also lead treatment agencies to use some of their profits to increase the extent to which they provide free care, in order to compete successfully to satisfy requests from referral sources.

To develop a basis for assessing these hypotheses, we gathered data on the views of chief executive and chief financial officers of the agencies about the desirability of various payers. Medicare is viewed generally as a desirable payment source: 12 of the 21 agencies responding consider Medicare "desirable," 9 consider it "mixed" (both desirable and undesirable), and none consider it "undesirable."[4] Agencies like the following attributes of Medicare payment: the high volume of patients (six agencies mentioned this attribute), timeliness of payment (five agencies), and good rates (three agencies). Agencies dislike the paperwork (three agencies) and slow payment (three agencies). We obtained these characterizations of Medicare through open-ended questions. Thus, the responses that we report were volunteered, and do not imply that other agencies do not share these sentiments. Note that some agencies perceive Medicare payment as timely, and that some perceive it as slow.

Medicaid is generally considered an undesirable payment source: 10 agencies consider it "undesirable," and 9 consider it "mixed"; no agency considers Medicaid "desirable." (The other three agencies did not respond because they do not do business with Medicaid.) Hospital-based agencies (one of four agencies reporting "undesirable") and not-for-profit agencies (five of nine agencies) are somewhat less likely than the for-profit agencies (six of eight agencies) to consider Medicaid undesirable. Views about Medicaid do not seem to differ by the size, treatment or control status, or urban or rural location of agencies, or by the level of competition in the area. Problems mentioned

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[4]One agency, which was part of a large HMO, did not make a substantial distinction between payers, because the majority of its patients were from the HMO, rather than from Medicare. Within the home health agency, all patients were treated in the same way, and the paperwork was standardized.

with Medicaid include low rates (nine agencies), prior authorization controls (five agencies); the limited number of allowable visits (four agencies); slow payments (four agencies); state funding running out (four agencies); and rate cuts, inadequate coverage, and an inability to get an answer from the state about billing questions (two agencies each).

Agencies rate private insurance about equal to Medicare: 13 of 19 agencies that receive this form of payment consider it "desirable"; 4 consider it "mixed," and 2 consider it "undesirable." The other 3 of the 22 agencies did not respond to the question about the desirability of private insurance, because they do not receive insurance payments. Desirable attributes of private insurance include good rates (five agencies), timely payment (three agencies), and clear coverage (two agencies). Undesirable attributes include the problems of dealing with the diverse coverage, eligibility, and benefits of the private insurers (mentioned by three agencies) and slow payments (also mentioned by three agencies). Among agencies receiving private insurance payments, larger agencies (those that provide more than 7,000 visits per year) tend to consider private insurance to be a desirable payment source. Nine of the 11 large agencies consider private insurance desirable, whereas the eight smaller agencies were evenly split concerning whether private insurance was desirable.

Most agencies do not view HMOs as desirable payers. Among the 15 agencies that received HMO payments, five reported HMOs as "desirable" (1 of the 5 belongs to an HMO), 8 consider them as "mixed," and 2 view them as "undesirable."[5] One large, urban, not-for-profit agency considers HMOs a desirable payment source because it views HMO business as a potential growth area. This agency believes that HMOs offer reasonable rates. It also believes that, by operating efficiently, it can show HMOs with their own home health agencies that it can save them money by contracting out to a larger more efficient provider. The most commonly disliked attributes of HMOs are limits on the number of allowable visits (5 of 15 agencies), low rates (3 agencies), and slow payment (2 agencies). With respect to HMOs, treatment agencies and control agencies differ only in that more

[5]Seven agencies, which do not receive HMO payments, did not respond.

treatment agencies than control agencies have HMO business (nine versus five, respectively), and that the treatment agencies tend to view HMOs somewhat more positively (three "desirable" and six "mixed") than do control agencies (one "desirable," two "mixed," and two "undesirable").

The information that we obtained from nine of the treatment agencies on likely changes in the mix of payers is interesting. (We did not obtain this information from control agencies or the other two treatment agencies.) Six of the nine treatment agencies reported that their payer mix was likely to change. The larger, urban treatment agencies appear more likely than the smaller, rural and small-town treatment agencies to anticipate change in the mix. Two agencies that view Medicaid as "mixed" (rather than undesirable) expect more Medicaid business, and one, which views it as undesirable, expects less business. Three agencies expect more HMO business; four expect more patients with private insurance. These changes could help the agencies during the demonstration: by increasing visits paid by non-Medicare sources, an agency might reap the benefits of economies of scale without having its rates reduced by the volume adjusters of the demonstration (which are based only on the number of Medicare visits).

D. CHANGES IN GEOGRAPHIC AREAS SERVED

Agencies receiving prospective rates have incentives both to expand and to contract the geographic areas that they serve. Agencies that can deliver visits at a cost below the prospective rates have an incentive to increase visits by expanding into areas with the potential for a high volume of visits. (Agencies might use existing offices to serve new areas, or might open branch offices.) Alternatively, the prospective rates might give agencies an incentive to curtail service to areas with the highest average costs, that is, to communities with high travel costs (for example, low-density neighborhoods and more distant communities) and to those with high crime rates, in which escorts must accompany the nurses and aides.

On the basis of our initial case-study interviews, it appears that treatment agencies are expanding their geographic service areas more than are control agencies. Since the beginning of the

demonstration, four treatment agencies and one control agency have expanded their areas; no agency has reduced its service area. This growth in service areas has taken many forms. Two of the five expanding agencies took over other agencies, whereas the other three expanded their services to encompass larger geographic areas. Two of the five expanding agencies (including the one expanding control agency) did so by opening branch offices; the others expanded the areas served by existing offices. This greater geographic expansion by treatment agencies is intriguing. Throughout the demonstration, we will continue to monitor this difference between treatment and control agencies.

E. SUMMARY OF SERVICES, MIX OF PAYORS, AND GEOGRAPHIC AREAS

In summary, the extensive change and competition in the home health industry compels agencies to assess their services, areas served, payment sources, and marketing activities constantly. Treatment agencies and control agencies appear to differ, particularly with respect to services, new contracts with prepaid providers, and geographic expansion. However, in general, treatment agencies in our case-study sample appear somewhat less likely than control agencies to be planning for rapid growth. We believe that this difference reflects the control agencies' higher rate of predemonstration growth, and a tendency for agencies that have grown rapidly to plan for additional growth. However, due to the small sample size available for the case-study analysis, this conclusion must remain tentative.

Differences in strategic plans and marketing activities might be emerging according to the size of the agency, the type of agency, and geography. Our analysis of the case-study sample indicates that larger agencies might be more likely than smaller agencies to have formal strategic plans, that hospital agencies have a special responsibility to serve the needs of the hospitals with which they are affiliated, and that staff in urban agencies view the home health market as more competitive than do the staff at rural agencies. These issues will be among the key foci of next year's studies.

F. DIFFERENCES BETWEEN URBAN AND RURAL AGENCIES

We observe several differences between urban and rural agencies with respect to corporate and strategic planning. Rural agencies were somewhat less likely to report intentions to change their payer mix and less likely to report highly competitive markets for their services. The only agency that did not have any plans to expand or maintain its market was a small, rural hospital-based agency.

III. CHANGES IN THE HOME CARE POPULATION AND IN MEDICARE COVERAGE

Under the per-visit prospective rate-setting system, agencies have an incentive to shun patients who are likely to have lengthy, expensive visits. This incentive might lead agencies to change the mix of patients that they serve and might affect access to care. Agencies paid on a per-visit basis also have an incentive to provide more frequent visits and longer episodes of care to patients that they do accept.

However, factors other than the implementation of per-visit rate setting might affect the mix of patients served by agencies and the amount of care they receive. The two most important factors are (1) changes in the characteristics of the home health care population, and (2) the revisions to the home health coverage regulations that became effective in July 1989. It is important to document the effects of these factors in order to understand the context in which the demonstration operated and to assess the likely effects of efforts to implement per-visit rate setting nationally.

In this chapter, we describe the extent to which the mix of patients served in the treatment and control agencies has changed with the changes in home health population and with the July 1989 revisions of coverage. With this background, we return in Chapter IV to the effect of per-visit rate setting on the number and length of visits, and in Chapter VI to its effect on access to care.

A. CHANGES IN THE HOME HEALTH CARE POPULATION

The population served by home health agencies is changing. Generally, these changes are externally imposed on the industry, although some result in part from the marketing strategies of agencies. Moreover, there is no evidence that the changes differ for the treatment and control agencies, or that they are related to the demonstration.

1. General Changes in the Home Health Population

The great majority (18) of the 22 home health agencies we studied indicated that the home health care populations that they serve are changing. For 17 of the 18 agencies observing changes, the changes predate the entry of the agencies into the demonstration. Among the remaining 4 agencies, 3 reported that their served populations are not changing and one agency was unable to respond. (In this last agency, the respondent was unable to comment on changes in the served population, because she had joined the staff of the agency after the demonstration began.)

All of the agencies reporting changes in the home health care population indicated that they currently serve more acutely ill patients. The agencies reported two factors as the primary causes for this change: (1) hospitals are continuing to discharge patients earlier in their recovery process, so that discharged patients are generally more ill, and (2) agencies are providing more high-technology care, particularly intravenous therapy (IV), in the home.

The agencies reported that hospitals began the practice of discharging more acutely ill patients several years ago, when Medicare payment for inpatient stays on the basis of diagnosis related groups (DRGs) was introduced. After the introduction of DRGs, hospitals began to reduce the length of inpatient hospital stays, and patients were more likely to be discharged when they were clinically unstable. In addition, agencies felt that with shorter inpatient stays, patients receive less education about their health problems, needs, and care, and less rehabilitation during their hospital stays. Therefore, home health agencies must provide those services.

Furthermore, the agencies reported that hospital discharge planners and physicians are increasingly comfortable with the idea of providing health services in the home. This change in attitude reflects (1) the growing experience of providers with home health care, (2) the July 1989 changes in regulations that permit agencies to provide more frequent visits, and (3) the increasing availability of trained home health staff to provide IV therapy and other high-tech services

successfully at home. Indeed, several hospital-based agencies reported working with the discharge planners of their hospitals to secure referrals for in-home IV care.

Thus, the discharge of more acutely ill patients and the provision of high-tech care seem to interact. Because patients are more acutely ill at discharge, the demand for home health services has increased, including the demand for high-tech services. The demand for the provision of high-tech services at home in lieu of hospitalization has also increased in response to the general demand for more cost-effective health care. To meet this demand and to open new markets, home health agencies increased the supply of in-home high-tech services, as well as the frequency and amount of more traditional home health care. As agencies demonstrated that acutely ill patients could be cared for at home, and that high-tech services could be provided safely at home, physicians became more comfortable with the idea of discharging patients earlier in their recuperation, as well as with the idea of ordering high-tech care at home. Consequently, the demand for home health services increased further.

Managing and evaluating a patient care plan (which is permitted under July 1989 revisions to the Medicare home health regulations) also seems to increase the proportion of acutely ill patients on an agency's caseload. Although only one agency responded to a question about the determinants of change in the patient population by mentioning this benefit, several agencies mentioned that they were using care plan management and evaluation to provide ongoing monitoring of medically unstable patients. (We discuss the management and evaluation of a patient care plan in detail in Section B.)

The other reported changes in the home health care population seem to be the result of localized phenomena, such as local shortages of nursing home beds, cuts in local funding, and an influx of immigrants with multiple needs resulting from inadequate past care.

2. Treatment and Control Agencies

We find little or no evidence of current or pre-existing differences between treatment and control agencies with respect to changes in the populations served. The great majority of the control

agencies (8 of 10) and all of the treatment agencies responding to these questions reported that their served populations were changing. Moreover, the types of reported changes are related to changes in the health care system and market and predate the demonstration. Although we asked specifically about any *additional* changes in the served population since the beginning of the demonstration, no such changes were reported.

B. REVISIONS TO MEDICARE COVERAGE

Effective in July 1989 (15 months before the demonstration began), HCFA revised the Medicare regulations to expand the types of home health care covered under Medicare. The most important of the revisions provided for (1) a new home health treatment, the management and evaluation of a patient care plan, (2) liberalization of the interpretation of intermittent or part-time care to permit more visits per day and per week and to permit very infrequent visits (for example, every 60 days), and (3) the coverage of skilled care for chronic conditions (in general, only acute conditions had been covered previously).

1. Effects on Home Health Agencies

We asked the staff of the 22 home health agencies whether the revisions affected the care that their agencies provided. The great majority of the agencies (19 of 22) reported that the care had been affected. Staff of two of the three remaining agencies reported that they were unsure whether it had been affected. Only one agency responded that the revisions had not affected the care that it provided, although there may have been a small effect since staff of this agency estimated that two or three of the patients on their caseload would not have been covered under the Medicare regulations in effect prior to July 1989.

Despite the general agreement that care had been affected, agencies differed with respect to the extent of the effect of the July 1989 revisions. Six of the 19 agencies reporting an effect indicated that they provided very little additional care as a result of the revisions.

a. Management and Evaluation of Care Plans

Most agencies (16 of 22) reported providing management and evaluation of patient care plans. The proportion of patients currently being provided with such care is generally modest to small, although the variation across agencies is considerable. At two agencies, nurses reported that 10 percent and 15 percent of their patients, respectively, were receiving care plan management and evaluation, and one agency reported that 5 percent of its entire caseload was receiving this service. In contrast, other agencies reported that only a few of their patients were receiving management and evaluation of care plans. Some agencies that provide few visits to manage or evaluate care plans reported being deliberately conservative about the benefit or acknowledged that they might be under-using it. Another agency reported that it had only recently begun to provide care plan management and evaluation.

The way in which agencies use care plan management and evaluation also appears to differ widely. Of the ten agencies that described the type of patients to whom they provide care plan management and evaluation, one-half stated that they provide this service to patients whose conditions were medically unstable or who were noncompliant (two of these agencies believed that providing intermittent skilled nursing visits to such patients had reduced hospital readmissions among this population, particularly for falls, dehydration, or exacerbation of the patient's condition). Two agencies reported using the care plan management and evaluation benefit to continue to provide aide care, as well as periodic skilled care; one of the two reported using the most highly skilled aides for medically unstable or noncompliant patients. One possible use of care plan management and evaluation is to monitor situations in which the primary caregiver is limited. One agency mentioned using care plan management visits to monitor a patient with family problems, and one mentioned using it to monitor the care provided by aides from a state personal care program. Two agencies reported using care plan management and evaluation to provide therapy. Agencies appear to use the benefit to maintain an ongoing program of therapeutic exercises, sometimes with the assistance of a home health aide (Case Note III.1).

CASE NOTE III.1

CARE PLAN MANAGEMENT AND EVALUATION

After rehabilitation for a hip fracture, a patient with Parkinson's disease was recertified for care plan management and evaluation. The patient had attained the maximum level of functional independence; however, to maintain this level of independence, the patient needed continued assistance, in the form of an exercise program. The patient's spouse was too frail to provide the required assistance. Under the care plan management and evaluation benefit, a skilled nurse set up a maintenance therapy program. Under this program, a home health aide visited the patient two or three times per week, to assist the patient with exercises. The skilled nurse visited the patient periodically, to review the maintenance therapy program with the aide.

We did not specifically ask agencies how long they provide care plan management and evaluation; therefore, we do not have complete information on this issue for all 22 agencies. Different agencies appear to provide the benefit for different lengths of time. One agency reported recertifying patients for one or two more certification periods for care plan management and evaluation; two reported recertifying for as many as three or four certification periods.

Agencies in Massachusetts reported that patients who are dually eligible for Medicaid and who would have received periodic skilled nursing visits through Medicaid in the past now receive the visits under Medicare care plan management and evaluation. The State of Massachusetts has urged agencies to continue to serve such patients under Medicare, rather than to transfer them to Medicaid.

b. General Relaxation of Coverage

Fourteen of the 22 agencies perceived the July 1989 revisions as signalling a general relaxation of coverage restrictions. After the revisions were instituted, the agencies reported feeling more comfortable about providing needed care. One staff member commented, "You won't be chastised now if you give enough care to a patient." Another stated, "Nurses are no longer so paranoid about staying in so long."

Although the July 1989 revisions did relax the interpretation of intermittent or part-time care, they coincided with a general relaxation in the late 1980s of the interpretation of covered visits. This

change began before July 1989 and is associated with a substantial decrease in denial rates, which followed a peak in the mid-1980s. It might be difficult for agencies to separate the impact of the July 1989 revisions completely from the impacts of other, concurrent changes. One agency commented that the relaxation was part of a general trend, and not necessarily a result of the July 1989 revisions.

Eight agencies mentioned that the regulations had been relaxed with respect to the provision of care by home health aides. Four of the six agencies in Texas reported that it was now easier to provide two aide visits per day (in the morning and the evening), when the agency felt that such care was required by the patient's conditions. The fact that no other agencies reported this specific change suggests that the coverage of two aide visits per day might have varied between fiscal intermediaries. However, we cannot conclude that this was the case, because we did not include a specific question on changes in the coverage of visits by aides, nor did we interview staff of the former fiscal intermediaries of participating agencies.

c. Care of Patients with Diabetes and Other Chronic Conditions

Nine of the 22 agencies mentioned that the July 1989 revisions in the coverage regulations enabled them to provide more care to patients with chronic conditions. Most (seven) of the nine agencies specifically reported providing more care to diabetic patients. One agency stated that it could now serve patients with end-stage Alzheimer's disease, and one mentioned more service to patients with chronic lung or heart conditions.

The agencies that reported providing more care to diabetic patients mentioned providing skilled nursing visits for insulin prefills, insulin injections, and periodic venipuncture for blood tests. One agency mentioned evaluating diabetic patients for risk of skin breakdown and foot problems; however, we could not ascertain whether this evaluation was performed in conjunction with visits for insulin prefills, insulin injections, or venipuncture, or whether the agency is using care plan management and evaluation to monitor the patient.

The effect of the July 1989 revisions on the provision of care to diabetic patients appears to depend on the agency's former fiscal intermediary. One agency reported that its former fiscal intermediary (Blue Cross/Blue Shield of Iowa) had covered insulin prefills and insulin injections. Three other agencies reported that such care had *not* been covered by their former fiscal intermediary (Blue Cross/Blue Shield of New Mexico), and another reported feeling much more comfortable providing such care than it had under its former fiscal intermediary (Blue Cross/Blue Shield of Southern California). One of the agencies whose former fiscal intermediary had been Blue Cross/Blue Shield of New Mexico reported that it was now able to provide much better care for its diabetic patients (including periodic testing of fasting blood sugars, as well as insulin prefills and injections), and that the physicians of the diabetic patients were quite pleased with the change in the quality of care. In one case, this agency had been able to ensure routine insulin injections and to eliminate frequent hospitalizations (Case Note III.2). Finally, although some agencies reported that the demonstration fiscal intermediary, Blue Cross/Blue Shield of South Carolina, is generally stricter than their former fiscal intermediaries in interpreting coverage and in requiring documentation, most report little or no difference directly related to the July 1989 revisions. Only three agencies reported such a difference; each of these agencies reported that Blue Cross/Blue Shield of South Carolina is more strict than their former fiscal intermediaries about the provision of care plan management and evaluation.

CASE NOTE III.2

CARING FOR A PATIENT WITH DIABETES

Since the death of her husband, several months previously, this blind diabetic patient had not had a reliable caregiver to administer her insulin injections. Although the agency had trained a neighbor to administer the injections, when the neighbor was busy, she would forget to administer the insulin. In the year before the July 1989 revisions, the patient was hospitalized five times for diabetic complications. Since the July 1989 revisions, the agency has administered insulin injections daily, and the patient has not been hospitalized.

2. Treatment and Control Agencies

No pre-existing differences between treatment and control agencies with respect to the July 1989 revisions appear to exist. Ten of the treatment agencies and nine of the control agencies reported that the care they provide has been affected. Nine of the ten treatment agencies in which care had been affected and all nine of the control agencies reporting an effect increased their provision of care plan management and evaluation. Seven of the treatment agencies and five of the control agencies reported a general relaxation in the amount of care provided.

IV. CLINICAL COSTS

Clinical costs account for the bulk of total home health agency costs and, therefore, represent a major target for any cost cutting induced by prospective rate setting. To assess what actions agencies have taken in this area, we asked agency directors, clinical supervisors, nurses, and therapists to describe their general clinical procedures. We also asked whether there had been any changes in these procedures that had affected clinical costs since the demonstration began and, if so, the nature of those changes. We specifically asked about changes affecting costs of clinical personnel, supervision and training of staff; supply expenses; and paperwork expenses.

On the basis of our case study, it appears that agencies are looking for ways to cut clinical costs, but that very few, if any, changes have resulted from the demonstration. Instead, agencies appear to have long-standing interests in cost control, which lead them to search continually for ways that they can better use available resources to provide quality care. Agencies seem to make changes in order to increase the efficiency and productivity of their clinical staff and to streamline paperwork.

We begin our analysis of clinical costs by reviewing the incentives of agencies to control clinical costs. We then describe what the 22 case-study agencies are doing to control clinical costs, and the types of changes we expect to see emerge during the demonstration.

A. CHANGES THAT AGENCIES MIGHT MAKE TO CONTROL CLINICAL COSTS

The prospective rate setting of the demonstration gives agencies an incentive to cut the clinical costs associated with home health visits, because agencies that can lower their clinical costs stand to reap increased profits. In seeking to cut clinical costs, agencies look at:

- The salaries and fringe benefits paid to staff
- The mix of staff in terms of education and experience (and, hence, salary), and whether the agency is recruiting overqualified staff; for example, agencies look for ways in which physical therapy assistants, Licensed Vocational Nurses (LVNs), or social work assistants can help perform some of the work of more experienced clinical staff

- Staff schedules, particularly the amount of time devoted by clinicians to activities other than patient care (for example, travel time and down time)

- Work assignments, particularly whether work performed by more highly paid staff could be performed by less highly paid staff

- Supervision patterns, particularly whether in-home supervision, paperwork review, and supervisor: staff ratios can be modified in order to lower costs while agencies continue to provide adequate supervision

- Paperwork, and the extent to which systems can be changed to improve efficiency and accuracy or to assign record keeping tasks to clerical rather than clinical staff

- Non-labor clinical costs, including supplies used to provide the care, travel costs, and communication costs

Although agencies investigate all of these areas to find efficiencies, they often find their range of possible actions constrained by the complex interrelationships between the functions needed to perform the various clinical activities, their staffing patterns, and Medicare regulations. For example, efforts to cut costs by lowering the education and experience requirements for clinical staff might trigger a compensatory need to increase supervision or inservice training in order to maintain the quality of care and satisfaction of referral sources. Similarly, the intense competition in the labor markets for clinical staff restricts the ability of any one agency to cut clinical costs by lowering salary or fringe benefit levels. Furthermore, agencies that cut supervision or other management oversight activities run the risk of reducing the average quality of the care or of otherwise jeopardizing the operations of the agency. Thus, although the incentives of prospective rate setting might lead agencies to cut clinical costs, we expect that agencies will make these cost-cutting decisions cautiously. In addition, agencies might have good long-term reasons for increasing clinical costs during the demonstration despite profit incentives, for example, training staff to use a new computer system to increase long-term productivity.

Efforts to improve the handling of paperwork can also have undesirable consequences. For example, by eliminating paperwork, an agency might reduce its ability to use the paperwork to structure how clinical staff do their jobs, thereby decreasing the value of paperwork as a quality-

control tool. Many agencies have used paperwork to "walk" clinicians through the care-planning steps, and to ensure that clinicians have completed all the required steps in a visit. Clearly, streamlining paperwork should not eliminate its supportive and monitoring aspects.

B. CLINICAL OPERATIONS IN DEMONSTRATION AGENCIES

Agency directors and staff reported that, although they were actively looking for ways to control costs, most of their current efforts pre-date the demonstration. In this section, we review these current efforts and the few instances in which we observe differences between treatment agencies and control agencies. We begin by examining personnel costs, which are the largest component of clinical costs. We then examine supervision patterns, staff training, paperwork, and non-labor clinical costs.

1. Personnel Costs

During our initial round of interviews, we found that agencies were examining their personnel costs, but that the demonstration had led to few, if any, changes. When examining the actions taken by agencies with respect to staffing patterns, plans, and costs, we focused on three interrelated issues: (1) competition for staff, and the pressures that competition places on agencies, (2) recruiting and retaining staff in a competitive labor market, and (3) methods to increase efficiency and productivity. For each of these areas, we describe the incentives created by the demonstration, the extent of any pre-existing or emerging differences between treatment and control agencies, and the major trends that will influence both treatment and control agencies.

a. Competition

Competition strongly affects the ability of an agency to reduce clinical costs in response to demonstration incentives. The greater the degree of competition for nurses and other staff, the more difficult it is for an agency to reduce wages, benefits, or other expenditures that enhance the attractiveness of the work environment for staff. Furthermore, lowering wages makes it difficult for

agencies to recruit the staff needed to fulfill agency expansion plans. Finally, employee morale m[illegible]t be affected by expectations that existing staff absorb additional visits or increase productivity.

Most case-study agencies reported that competition for staff is moderate to high. Twelve of 22 agencies reported high competition, and eight reported some competition; only one agency reported no competition (one control-agency response was missing). Large agencies (more than 7,000 visits per year) tend to perceive competition as more intense than do small/medium-sized agencies (less than 7,000 visits per year). Seven of 11 large agencies and 5 of 10 small/medium-sized agencies reported that competition is high; 4 large agencies and 4 small/medium agencies reported some competition. The single agency that reported no competition is a medium-sized agency (3,500 to 7,000 visits per year).

The perceptions of the treatment agencies and the control agencies differ little. Five treatment agencies and seven control agencies reported high competition for staff, and five treatment agencies and three control agencies reported some competition; one treatment agency reported no competition (as noted above, one control-agency response was missing). Urban treatment and control agencies reported similar experiences. Five urban treatment agencies and five urban control agencies reported high competition; four and three, respectively, reported some competition. However, the responses of rural treatment agencies and rural control agencies differ. One rural treatment agency reported some competition, and one reported no competition, whereas both rural control agencies reported high competition.

The degree of competition for different types of staff appears to vary. For nurses, hospital-based agencies generally reported less competition than did free-standing agencies. The former seem to have some success in attracting nurses from within their own hospital systems. Urban agencies, in particular, reported strong competition for nurses, especially for high-tech and AIDS programs.

Competition for all therapists (physical, occupational, and speech) appears to be high in all settings. However, therapists are sometimes simply unavailable in rural areas. Therapists generally are hired on a full-time basis by one or more therapy staffing organizations, which provide therapists

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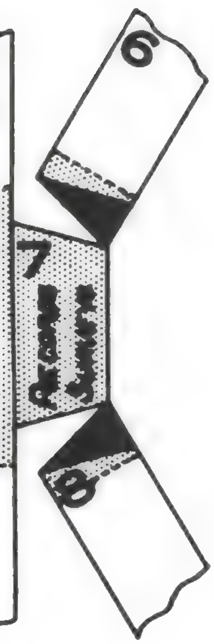

D SEPARATOR SHEET

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DEVELOP AND DEMONSTRATE A METHOD FOR CLASSIFYING HOME HEALTH PATIENTS TO PREDICT RESOURCE REQUIREMENTS AND TO MEASURE OUTCOMES

by

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Georgetown University, School of Nursing

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EXECUTIVE SUMMARY

Overview

The major objective of the Georgetown University School of Nursing Home Health Care Classification research project was to develop a method to assess and classify the home health Medicare patients in order to predict their need for nursing and other home care services as well as measure outcomes of care. To accomplish this goal, data on actual resource use which could be objectively measured were used to predict resource requirements.

A national sample of home health agencies, randomly stratified by staff size, type of ownership, and geographic location was selected. Of the 5,880 Medicare HCFA 1986 certified home health agencies 646 participated in the study. They were from every state in the nation and from Puerto Rico and the District of Columbia. The sample agencies each abstracted 5 to 50 Medicare patient records providing a total of 8,961 cases. The database assembled represents the largest compilation of pertinent information ever collected on home health agencies and patients.

Retrospective data were collected, using a specially designed Abstract Form, on each of the Medicare patient's entire episode of home health care from admission to discharge. Data on all relevant variables considered to be possible predictors of home health care were collected. The data included a wide range of variables: demographic, functional status, medical diagnoses, surgical procedures, nursing diagnoses/patient problems, nursing interventions/services, admission and discharge data, and data on the length of the episode of care and home visits made by various providers.

Since there was no agreement when the study began on which specific variables predicted home health visits, the data from the sample of 8,961 patient records were thoroughly examined to analyze the statistical significance of alternative classification methods.

The study products included descriptive findings on the universe of home health cases and predictive findings on the variables that measured resource requirements. Several schemes were also developed for coding nursing diagnoses and nursing interventions. Finally the study produced a three cohort model based on the length of the episode of care as an approach for a preliminary home health care classification method. The method, with further refinement, could form the basis for a prospective payment system for home health care.

The study findings can be grouped into four major areas:

- Descriptive findings on characteristics of home health agencies and patients;
- Predictive findings on the relationship between measures of resource use and predictors of resource requirements;
- Cohort findings based on length of the episode of care and number and type of home visits;
- Preliminary Home Health Classification Method.

Descriptive Findings

Home Health Agencies

The descriptive analysis strongly suggests that home health care for Medicare patients in this country is efficient and effective. Home health programs are administered by certified home health agencies (HHAs) that vary by staff size and type of ownership, and are found in all geographic locations. The HHAs offer an array of home health services with the major service being skilled nursing care. Home health nurses not only give nursing care but also manage the care of patients provided by a mix of other providers.

Home Health Patients

The home health Medicare patients being served are predominantly elderly, white, middle class females, married or widowed, living in their own homes with an available caregiver. The vast majority (93.8%) of patients were 65 years of age and over, and more than half of these were at least 75 years old. Sixty percent were females, less than half were married and nearly half were widowed. Nearly one-third of the patients lived alone and over 25 percent were the primary care-givers thus essentially relying on self-care. The majority of the patients were oriented and were able to comprehend and communicate.

Three-fourths of all sample patients were admitted to the home care program through hospital referral reflecting the impact of shorter hospital stays with patients discharged "sicker and quicker" resulting from Medicare's prospective payment system based on DRGs. Nearly half of the patients were under the care of the home health agency for thirty days or less. On the average, the patients received 11.9 nursing visits as compared to the 18.2 all providers visits which were weighted to reflect two-thirds of a home health aide visit because of their lower visit costs.

Patient Assessments and Services

The assessment of the home health patients and the services provided yielded other findings of interest. In general, the average patient was assessed as having an average of three nursing diagnoses and five different types of nursing interventions for the episode. These findings provided a new dimension on home health Medicare patient care. These classification variables were analyzed as predictors of resource requirements.

Finally, the data revealed that there were significant improvements in the health status of the patients from admission to discharge. Three-quarters of the patients were evaluated as improved, recovered, or stabilized on discharge. According to the primary nurse providers in the agencies, most patient goals were fully or at least partially met. The functional status ADL scores for patients showed a significant improvement in each of the functional areas. The study thus documents the efficacy of home health care.

Predictive Findings

Predictive Variables

The predictive analyses demonstrated that home health care can be predicted reliably and that a home health classification method is feasible. Five types of classification variables (independent variables) were considered to be the major predictors of resource requirements, and four variables were selected as measures of resource use (dependent variables). They were selected based on the preliminary analysis, a review of the literature and recommendations from home health nursing experts and researchers in the field. They were analyzed separately and in various combinations, regrouped and reanalyzed.

Classification Variables (Independent Variables)

The five types of classification variables (independent variables) were evaluated as predictors of resource requirements. The variables focused on the assessment of the patient's condition: functional status, nursing diagnoses including discharge status (improved, maintained, deteriorated), nursing interventions including type of action (assess, care, manage and teach), primary medical diagnosis or surgical procedure and on selected demographics. Although the actual discharge status was used it was a proxy for the expected outcome.

Measures of Resource Use (Dependent Variables)

The four measures of resource use (dependent variables) focused on the volume of home health visits by all providers, and length of the episode of care. The number of home visits were analyzed by each type of provider. They were regrouped into nursing visits only and visits by all providers which were weighted by deflating home health aide visits by a factor of .67.

The length of an episode of care was determined by counting the number of days between the first and last visit. They were also regrouped according to the number of visits made during the first thirty days, and during the total episode of care. These two groups were used in combination with the two types of provider visits.

Analysis of Classification Variables

Linear regression was used to compute a regression coefficient for each classification variable – demographics, nursing diagnosis and nursing intervention components – where a single case is a member of more than one group. Analysis of the variance (ANOVA) was used for functional status, medical diagnosis or surgical procedure, combinations of discharge status groups or combinations of nursing intervention types – where a case is a member of only one group. Two other techniques – stepwise regression and logistic regression – were also examined but were found not to be useful.

The major findings were:

- **Demographics:** The demographic variables had little predictive power by themselves.
- **Functional Status:** The functional status variables had limited predictive power. Both the RUGs ADL and the GU ADL scores were the poorest of all the predictor variables, even though the GU ADL improved slightly when predicting weighted visits.
- **Nursing Diagnosis Components:** The twenty (20) nursing diagnosis components yielded the second best predictor of resource requirements for both nursing and all weighted provider visits for the first thirty days and for the total episode of care.
- **Nursing Intervention Components:** The twenty-two (22) nursing intervention components were a better predictor of nursing visits than all weighted provider visits for the first thirty days of the episode. Further, by combining them with the four types of nursing intervention actions, the best predictor of resource use was obtained for any of the classification (independent) variables.
- **Medical Diagnosis or Surgical Procedure:** The primary medical diagnosis or surgical procedure groups did not have high predictive power.

Cohort Findings

The three cohort model emerged as another significant finding from the analysis of the visit data. During the first thirty days, five to seven nursing visits were provided on the average for the short term cases (under 30 days), whereas nine to fourteen visits were provided for the intermediate cases (30 to 120 days) and nine to fourteen for long term cases (over 120 days). These findings identified a significant difference between the short term, acute care cases of under thirty days and the intermediate, and long term cases of over thirty days.

Home health care cases can be classified into three cohorts based on the length and type of case in days. The number of visits in the first thirty days will be significantly lower for the short term cases than for the intermediate or long term cases regardless of nursing diagnoses or demographic characteristics.

The abstract form and coding schemes for the nursing diagnoses and nursing interventions including the groupings of home health care components developed for this study can be used as the basis for the Assessment Instrument and Home Health Care Classification Method. They can also be used for more efficient documentation and reporting of home health care for reimbursement and a prospective payment system.

Limitations of this Study

The limitations of this study, and the need for a prospective study to validate and refine these findings, arise from the limits of retrospective data and the lessons learned from testing an assessment instrument with a large national sample. A prospective study would use prospective coding of nursing diagnoses and nursing interventions, collected on initial assessment, for each cohort with periodic updates and detailed visit data. Periodic assessments must be made longitudinally to elucidate the differences between short term, intermediate, and long term cases.

Recommendations

Notwithstanding the limitations of this study several recommendations clearly emerged from this research:

- Nursing diagnoses and nursing interventions should form the basis for a Home Health Care Classification Method for predicting resource requirements. The scheme of twenty (20) home health care components for the nursing diagnoses and nursing interventions should provide a new framework for assessing and classifying nursing care requirements of patients.

- The scheme of twenty (20) home health care components for nursing diagnoses and nursing interventions could enhance the existing HCFA forms 485, and 486 used to collect data on Medicare patients. It could provide the basis for a new reporting form for home health care reimbursement.

- The Home Health Care Classification Method should incorporate three patient cohorts based on the length of the episodes of care in days. Cohort placement and the levels of care for each cohort will serve as a refinement for predicting resource requirements.

These findings also demonstrated that home health visits could be predicted with a greater level of precision for cohort one than for cohorts two and three. Hence visits for both nursing and all providers (weighted) were considered to be predictable for the first thirty days with the existing data.

Preliminary Home Health Care Classification Method

Based on the study findings, a clinically sound and statistically significant Home Health Care Classification (HHCC) Method was developed. The HHCC Method includes a specially designed Assessment Instrument that encompasses the length of the episode which consists of three cohorts based on the length of the episode in days, and the nursing care requirements of the patient which consists of three levels of care for each of the three cohorts.

The nursing care requirements of patients for each of the three cohorts are based on five types of assessment data: (a) ten demographic variables, (b) twenty (20) nursing diagnosis home health care components, (c) measures of outcomes identified by three discharge status goals, (d) twenty (20) nursing intervention home health care components, and (e) four types of nursing interventions. The twenty-two (22) nursing intervention components were restructured to match the twenty (20) home nursing diagnosis components.

These variables are used to assess and classify patients using the specially designed Assessment Instrument. The patients are assessed on admission to home health care, and reassessed at thirty or sixty day intervals and other predetermined times. The patients are scored and classified for three levels of care for each of the three types of cohorts. The regression coefficients are used to weight and score the patients and predict the average number of home visits.

This classification method could be used as a basis for a prospective reimbursement system for home health care Medicare patients and the scheme of twenty (20) home health care components used for reimbursement like DRGs in hospitals.

Conclusions

The descriptive analysis demonstrated that home health care is provided predominantly to a white, suburban, young-elderly population. Less advantaged and higher risk patients appear to be more likely to enter long term care facilities.

The best approach to predicting home health care use is based on nursing diagnoses and nursing interventions rather than functional status or medical diagnosis. Demographics have a relatively small impact on resource use and selected demographics can be used to improve predictions based on nursing diagnoses or nursing interventions.

Other Recommendations

Two other recommendations also emerged that address the need for further analysis on the current research data, and for additional research.

Current Research

The data collected in this study should be linked to Medicare claims data on hospital and long term care episodes to enhance the understanding of resource use for home health care patients. Such analysis could also expand the existing information about the costs of home health care.

Further analysis is needed on the mix of skilled nursing and home health aide visits and on the home health aide visit alone in the first thirty days and total episode of care.

Additionally study is needed on nursing diagnoses and nursing interventions and their groupings of home health care components. Research is needed to determine the clusters of conditions and care requirements that relate to each other. This type analysis was not attempted in this study, but the findings showed definite relationships between these two variables.

Additional Research

A prospective research study based on the methods derived from this study should be carried out to refine and test the Home Health Care Classification Method and Assessment Instrument; to test the predictive models; and to generate additional data needed to elucidate the three cohort model. The prospective study should include periodic patient assessments, data collection on nursing diagnoses, nursing interventions, and the goals (expected outcomes) of care for each home visit.

This innovative research is critical to the development of a prospective payment system for home health care. It could improve the efficiency of home health care reimbursement and influence cost containment policy for the industry.

1. INTRODUCTION

This report describes the Georgetown University Home Health Classification (GUHHC) project conducted under a cooperative agreement between the Georgetown University School of Nursing and the Health Care Financing Administration (HCFA Cooperative Agreement # 17-C-98983/3-01). The major objective of the project, which began in 1987 and was conducted over a three and half year period, was to develop a method to assess and classify home health Medicare patients to determine their need for nursing and other home health services. It is anticipated that the findings of this project will contribute to the information base needed for future Medicare policy decisions concerning the home health industry.

Home health services have grown faster than any other segment of the health care industry in this country. Home health care refers to all services provided and products used to restore, maintain, and promote physical, mental, and emotional health to patients in their homes. The services are planned, coordinated, and made available by providers organized for the delivery of home care through the use of employed staff and/or contractual arrangements (Spradley and Dorsey, 1985).

The demand for home care services has expanded markedly as a result of the rising costs of hospital care, technological advances, and consumer preferences. In 1986 1.6 million people were receiving home care services (NAHC, 1986). The elderly population, the largest segment of home care clients, has been growing faster than any other population group. They have increased from 19.5 million in 1967 to 27.7 million in 1984 and it is estimated they will reach 50 million by the year 2010 (US Office of Technology Assessment, 1985). More of the elderly population are living longer (85 years of age) and will be using at least 25 percent of Medicare home care services by then (DHHS, 1988). Moreover, more than twice the number of elderly who receive formal home care services are estimated to have some limitation in their functional ability (Rowland 1989).

Federal reimbursement for home care services has been increasing since the passage of the Medicare legislation in 1965. In 1986 expenditures reached $2.6 billion (Rak, 1986). The annual compound rate of growth in Medicare reimbursements for home care services has been nearly 25% higher than for any other type of service except outpatient care. In addition, the adoption in 1983 of a prospective payment system (PPS) using diagnosis related groups (DRGs) as the method of hospital reimbursement for

Medicare beneficiaries resulted in early discharge of patients from hospitals. Many of these patients required further nursing services which were only available from home health agencies (Wood, 1984). Such services were viewed as alternatives to institutionalization and a means of containing health care costs. With increasing expenditures for home care services, attention was focused on the efficiency and effectiveness of these services.

Review of the literature on the home care industry clearly shows a lack of data about home health agencies and the services they provided (Berk and Bernstein, 1985; Wood, 1985/86). Moreover, there are no valid methodologies for assessing home health patients, classifying them according to resource requirements, or evaluating them according to professionally accepted outcomes. This research project was undertaken to address the gaps in methodologies for assessing and classifying home health services and measuring their outcomes.

2. BACKGROUND

Historical Perspective

Home health care as a community service in this country is not a new concept. In 1796 the Overseers of the Poor in Boston established the first home care program at the Boston Dispensary to care for the poor in their homes. In the early nineteenth century the visiting nurse movement began which provided care to the sick and indigent poor in their homes primarily in the crowded slum areas of large cities. In 1893, Lillian Wald established the first organized home nursing service, the Visiting Nurse Service of New York City. In 1909 she persuaded the Metropolitan Life Insurance Company to offer services to their policy holders in their homes (Mundinger, 1983). Thereafter, visiting nurse services and other types of home care agencies grew rapidly.

Federal involvement in home health primarily began with the Kerr-Mills legislation in 1961 (Public Law 86-778). Under its medical provision for the elderly, home care was linked to the Old Age Assistance program. In 1961 the Community Health Services and Facilities Act (Public Law 87-395) initiated the funding of grants to organizations for the development of outside-the-hospital health services.

Before the advent of Medicare in 1965, the majority of home care patients were chronically ill elderly persons whose greatest need for nursing care was the monitoring of their health status and supervision of their home care. Payment for such services came from private insurance, social welfare, or individual payment based on a sliding fee (Spradley and Dorsey, 1985).

Impact of Medicare Legislation

In 1965 the adoption of the Medicare legislation (Title XVIII of the Social Security Act, Public Law 89-97) with inclusion of home care benefits, greatly influenced the development and expansion of home health agencies (HHAs). The legislation required that HHAs certified for reimbursement of Medicare recipients provide not only nursing services but also at least one other service such as physical therapy, speech therapy, medical social work, or home health aide service. This regulation gave rise to today's multiservice HHAs. With Medicare a new era of home health services began. The reimbursement for services to patients, many of whom were previously unable to pay for their care, made expansion possible, not only in types of services provided, but also in

the number of HHAs. Medicare's impact on what were traditionally non-medical home care services brought about a medical-based model of practice (Mundinger, 1983). Patients had to be under the care of physicians responsible for planning, reviewing, and certifying the medically directed services provided by nurses or other professionals.

Home health services have grown faster than any other segment of the health care industry. In 1963 only 55.6% of the population lived in areas where home care services were available; in 1979 such services became available to nearly the entire population (Survey of CHN, 1979). In 1986 about 6,000 HHAs were Medicare certified, representing nearly a five-fold increase from the 1,275 certified home health agencies (HHAs) of 1966.

The cost of home health care has increased steadily. In 1985 the average Medicare reimbursement for home care per visit was $45.00 compared to $8.00 in 1966 and $30.00 in 1979. However, the cost was considerably lower than the 1985 average Medicare hospital reimbursement of $435.00 per day or the 1984 average Medicare skilled nursing facility reimbursement of $62.00 per day (NAHC, 1986).

Influence of Diagnosis Related Groups

A major factor contributing to the increasing need for home health services was the passage of the 1983 Social Security Amendment (Public Law 98-21) which established a national Medicare prospective payment system (PPS) of reimbursement to hospitals which was based on the diagnosis related groups (DRGs). One of the major effects of DRGs on the health care industry has been that hospital patients are being discharged "quicker and sicker" (Wood, 1985/86). Seventy percent of the HHAs reported an increase in the numbers of patients served. The 75 to 84 year old patients showed the greatest increase followed by those 85 years and older.

PPS created strong incentives for acute care hospitals to decrease a Medicare patient's length of stay. In 1984 the average length of stay was 7.5 days compared to 9.5 days in 1983 (HCFA, 1985). Earlier discharges of patients from hospitals created a growing need in the home for more technical procedures such as intravenous therapy, catheter care, ventilator care, and other services requiring highly skilled nursing services (Wood, 1984). Patients requiring multiple visits per day and per week for these specialized services increased, resulting in more visits per case. This was substantiated by a study by Kornblatt and others (1985), which compared two home care agencies (one private and one public) serving the same population group. They found that after implementation of DRGs there was an increase in the frequency of visits and in the intensity of care.

Thus, changes in the home health industry occurred because of several interrelated factors that influenced the conduct of this research project. They were due to increases in: (a) Medicare-recipients over 65 years of age population; (b) elderly persons requiring some type of care to remain independent and avoid institutionalization; (c) earlier hospital discharge of patients in the acute convalescent, or rehabilitative phase of their illness; (d) types and intensity of services being offered in the home; (e) frequency of home care visits required; and (f) cost of home care visits.

Statement of the Problem

The Georgetown University Home Health Classification (GUHHC) research project addresses a major problem in the home health delivery system – the lack of uniform and meaningful patient classification methods that predict resource requirements and measure patient outcomes. Resource requirements include variables such as intensity and provider mix of services; outcome measures include the factors that determine the appropriateness of terminating such services.

A major problem in the early 1980s with the home health payment system was its dependence on the interpretation by fiscal intermediaries of the Medicare guidelines developed by HCFA. Because of the ambiguities in terminology and policies, the lack of standard definitions among fiscal intermediaries affected the scope of services provided by agencies. For example, NAHC data demonstrated that the costs of a unit of service, whether measured by visit, time, or service, varied widely from agency to agency. Also, it was not possible to analyze services based on such factors as provider mix because of the inconsistencies in data provided by agencies (NAHC Report, 1986).

Traditionally, reimbursement systems and resource availability served as the basis for decision making in determining patient care requirements. However, as the demand increased, services paid by various reimbursement systems did not match the services needed by patients, nor did they adapt to changing needs. Further, as alternative reimbursement methods were being proposed for home care services, patient classification systems were being recognized as important management tools to translate patient needs into accurate measures for the allocation of resources. However, home health care does not lend itself to any simple uni-dimensional classification method because there is no valid and widely accepted method for designating a single construct to a case.

Several attempts have been made to develop alternative approaches for reimbursement; however, none were adopted by the federal government. Reimbursement was and continues to be accomplished by utilization review of patient records and 60-day certification of plans of treatment (Medicare HHA Manual, Transmittal Number 173, Sections 234.6 through 234.12, July 1985). The agencies are reimbursed on a cost-per-

visit which is predetermined by the Medicare cost methodology with monthly billing using the HCFA Form 1450, also known as UB-82, (Medicare HHA Manual, Transmittal Number 181, 1986).

The need for useful and usable methodologies exists more strongly than ever since the demand for home care services and expenditures for these services continue to increase. Numerous Congressional hearings have been held on various aspects of home health services, including their costs and utilization, Medicare coverage and policies, and quality assurance. Research is essential to develop substantive information to support the needed policy changes.

3. REVIEW OF THE LITERATURE

Studies have attempted to measure patients' requirements for home care services, including outcome measures. However, most studies are incomplete and uncoordinated, and offer no definitive solutions to the problem. In addition, even though there are a few patient classification tools, none relates classification to resource requirements and/or outcomes measures.

A classification instrument is generally used to classify patients according to their requirements for care over a specified period of time (Giovannetti, 1979). The instruments that are described include those that assess and classify patients in hospitals and long term care facilities, as well as those being cared for in homes.

Most research on patient classification has been conducted in acute care settings in hospitals. Earlier studies focusing on the nursing needs of patients and the workloads they presented, were conducted by the Department of the Army and by the Division of Nursing, United States Public Health Service (USPHS).

The quantification of patient classification according to the use of nursing resources was developed by researchers at The Johns Hopkins University. Their studies influenced subsequent efforts to refine patient acuity classification scales such as linking process-oriented quality measurements to DRGs (Levine and Abdellah, 1984). These studies show that in many hospitals, staffing of nursing personnel is based on hours of nursing care required per patient per day as determined by classification methods that assess either the acuity levels of patients or calculate the time needed to provide specific nursing services.

Assessment Instruments

Since the implementation of Medicare, several instruments have been designed to assess the characteristics and needs of home care patients. They include the evaluation of the functional status, physical health, mental health, economic status, educational status, social resources, and ability to carry out activities of daily living (ADL). For example, the Patient Progress Methodology (Roberts and Hudson, 1964) which

documented changes in the health status of community health nursing patients. Another example is the Community Health Systematic Nursing Assessment developed by Taylor and Johnson (1974) to collect data on the community health patient and family as a method of planning patient care.

An assessment instrument with implications for home care is Katz's Activities of Daily Living (ADL) Index derived from observations of elderly people with chronic illnesses. It is one of the best known and extensively used scales to assess the actual performance in six functions fundamental to independent activities of daily living (ADLs). Katz's ADL Index includes: (a) bathing, (b) dressing, (c) toileting, (d) transfer, (e) continence, and (f) feeding (Katz et al., 1963). Another function Katz used for assessment in the home is mobility (walking) which relates to the patient's ability to move around in or getting out of his/her residence (Katz, 1983).

The six functions were conceived in an hierarchical order to demonstrate the natural progression in both the loss and the return of these abilities. Loss of function begins with complex activities, e.g., bathing and dressing and progresses through the least complex, e.g., continence and feeding. Recovery, according to Katz, proceeds through three stages: recovery of independence in feeding and continence, subsequent recovery of transferring and toileting, and, lastly, independence in bathing and dressing.

Another assessment instrument with implications for home care is the instrumental activities of daily living (IADL). This concept developed by Lawton represents a more complex range of activities organized at a higher level of human behavior than those needed for personal self-care such as the ADLs. The IADL focuses on the person's ability to cope with the environment. The major adaptive behaviors include: (a) using the telephone, (b) shopping, (c) food preparation, (d) housekeeping, (e) laundry, (f) transportation, (g) responsibility for taking own medication, and (h) ability to handle own finances (Gallo, 1988; Kane and Kane 1981).

Several variations of measures similar to IADL have emerged. According to Kane and Kane (1981), IADL scaling suffers from the difficulty of conceptualizing normal independent functioning since these complex activities themselves can be broken up into sub-tasks. Because these tasks are complex, and the interpretation of the response equivocal, IADL is better measured through such constrained and simple tasks such as using the telephone. The interpretation of IADL results is also difficult since all persons do not need to manage skills at the same level of complexity.

The most critical assessment instruments for home health care were initiated in 1985 by HCFA. They consisted of three forms which had to be completed by certified HHAs for all Medicare patients requiring services (Medicare HHA Manual, Transmittal Number 173, Sections 234.6 through 234.12, July 1985). These forms were instituted by

HCFA as an attempt to standardize the recording of data needed for the certification and recertification of plans of treatment. The data are also used for the HHAs monthly billing for reimbursement of services by all providers using the UB-82 (HCFA Form 1450). The initial three forms include:

- Home Health Certification and Plan of Treatment Form (HCFA Form 485).
- Medical Update and Patient Information Form (HCFA Form 486).
- Plan of Treatment/Medical Update and Patient Information Addendum Form (HCFA Form 487).

These forms (Appendix 3.1) collects an array of assessment variables such as functional limitations, activities permitted, plan of treatment, goals, etc. However, they do not include any of the instruments described in the literature.

Classification Instruments

In community health nursing agencies, staffing requirements of nursing personnel traditionally have been based on the size of the total population served and not on any specific classification method. Desirable staffing for public health nursing was recommended to be a ratio of one nurse to 5,000 individuals in the general population and one nurse to 2,500 for the care of the sick at home (Lukasik, 1981). However, when the Medicare legislation was introduced, these ratios were no longer considered appropriate in view of the need to increase the access to home care.

In 1978, the Western Interstate Commission on Higher Education in Nursing (WICHEN), convened a Panel of Experts who recommended a ratio of one nurse to 1,000 population be used for home health care (Lum and Leonard, 1978). Subsequent panels devised a formula for calculating staffing requirements based on the size and characteristics of the populations served. The formula included the percentage of hospital discharges as well as numbers and types of home health programs available from the different state and local agencies (Lukasik, 1981).

Patient classification efforts with direct implications for this research include those developed outside the hospital setting. In the early 1970s a classification method was designed for program planning and resource allocation of patients with chronic diseases in long term care settings (Jones, 1974). This was an attempt to provide a tool for improving the care of the chronically ill through systematizing the information base upon which the planners and providers of care make decisions. The multidimensional classification scheme addressed: (a) socio- demographic items, (b) functional status, (c) impairments, (d) medical risk factors, and (e) medically defined conditions.

In 1970 the Visiting Nurse Association (VNA) of Omaha, NE. developed a classification scheme for client problems in community health nursing. It provides a standard nomenclature for precise assessments, effective care planning, and recording of client/family problems. The scheme consists of 49 problem labels, each with a cluster of signs and symptoms. The problems are categorized in four domains: (a) environmental, (b) psychosocial, (c) physiological, and (d) health behaviors (Simmons, 1980).

Several other classification schemes for home health care nursing services have also been developed. The Easley-Storfjell Instrument for Caseload/Workload Analysis correlates patient care needs with workload measurements. Two instruments provide a summary of cases and workload and serve as a basis for case assignment and management (Saba and McCormick, 1986; Easley-Storfjell et al, 1979). Another instrument to classify patients receiving care in outpatient departments was developed by Horn (1985) by adapting her Severity of Illness Index.

Another classification instrument, the Resource Utilization Groups II (RUGs), consists of three ADLs and one feeding technique: (a) toileting, (b) eating, (c) transfer, and (d) parental tube feeding. These ADLs were most effective in explaining differences in resource use in a study of nursing home-residents in New York State. They were chosen because they were statistically significant, less easily gamed, less affected by facility care, and provided incentives for quality of care. (Schneider et al, 1988).

Classification Studies

Several classification studies are relevant to this research. A study was conducted in nine Connecticut HHAs to determine which factors were most predictive of the quantity of nursing services utilized. This retrospective study of patient records found that the Health Status Score, which measured deficits in daily activities and nursing problems, was the best predictor (Ballard and McNamara, 1983).

Several studies conducted on the relationship between medical diagnoses and home health care revealed nothing of significance. According to Polick (1985), medical diagnoses did not predict the types and intensity of services required or the length of time those services were needed. Taylor's study of 58 Medicare certified HHAs in New Jersey concluded that medical diagnoses alone were not as reliable as medical diagnoses combined with age, functional status and severity of illness to predict service use (Taylor, 1988).

Several studies suggested that nursing diagnoses or patient problems are possible predictors of resource requirements. A nursing diagnosis is a statement that describes the human response of a patient which a nurse can legally identify and for which a nurse can order definitive nursing interventions (Carpenito, 1989). Hardy (1984) described a patient classification system for home health care using four nursing diagnoses (problems): (a) alterations in skin integrity, (b) respiratory dysfunction, (c) impaired mobility, and (d) impaired thought processes. This study suggested that a patient classification system could use nursing diagnoses and patient acuity to predict nursing needs.

Another study by Halloran and Kiley (1987) used nursing diagnoses to operationalize nursing dependency as an indicator of nursing resource use in an acute care hospital; the number of nursing diagnoses was primarily associated with allocation of time and effort spent by professional nurses with their patients.

Instruments to Measure Outcomes

Several attempts have been made to develop instruments for measuring the quality of home health services, including a variety of measurement approaches and methodologies that focus on the environment (structure), the actual care provided (process) and patients' responses to care (outcomes). While there are considerable interrelationships among these three dimensions, they are often assessed independently. Measurement of outcomes is considered an important dimension since it evaluates the effectiveness of services provided.

One example of measuring outcomes is the Sentinel Health Events (SHEs), a two-stage appraisal and follow-up of patients' care in extended care facilities. SHEs is simply a list of events (outcomes) such as decubiti or accidents that, when defined and weighted, can be used to evaluate the quality of care.

Another example is the Patient Classification System developed by Daubert (1979) which classifies patients into one of five groups according to their rehabilitation potential. All patients admitted to service are classified regardless of the number of medical diagnoses per patient or the mix of services required. Each of the five groups has been specifically defined to provide clarity and uniformity for assignment of patients to a group.

Another example is a prospective study documenting the care received by patients admitted to the Coordinated Care Program of the Massachusetts General Hospital and followed for their entire episode of illness including services provided in their homes. The aim of the study was to implement, evaluate, and facilitate clinical case management of community-based long term care of elderly clients including services in their homes (Zielstorff et al, 1986).

Still another approach to assessing outcomes emerged from the Omaha VNA's Classification Scheme for client problems. The scheme included the identification of the expected outcomes for each patient problem. It was envisioned that a patient problem could be measured by one of three expected outcome criterion measures: (a) prevention, (b) improvement, and (c) maintenance, and then compared to its actual outcome at a specified point in time (Simmons, 1980). The General Symptom Distress Scale developed by the Home Care Association of Washington measures seven outcome indicators for a specific illnesses. The Scale represents a method of identifying patients who are at risk in order to ensure that home health agencies are doing everything they can to manage symptom distress. It is a broad measure of patients' distress caused by 11 general symptoms that home health personnel consider important to monitor and manage for all home health patients, regardless of their diagnoses (LaLonde, 1987).

Home Health Databases

There are currently no comprehensive, multidimensional public use databases that contain information on home health agencies and the patients they serve including their characteristics, volume, and type of services provided. From time to time national surveys have assembled data on the characteristics of agencies, patients, and services provided, but these are not readily available.

Beginning in 1959, the Division of Nursing, USPHS, conducted periodic surveys of the availability of nursing services for the care of the sick at home. Data were initially collected only on populations served by State, county and cities with a population of 25,000 or more. The last Survey of Community Health Nursing conducted in 1979 contains data on the characteristics of Medicare certified agencies including personnel, type of services provided, and costs and fees for visits. In this survey one of the first attempts was made to collect visit data by specific programs.

Today, HCFA is the primary federal agency that collects data on the home health industry. Its Medicare and Medicaid Automated Certification System (MMACS) consists of an inventory of the survey and certification information. It includes data on all Medicare certified facilities including home health agencies, type of ownership, and their number and mix of personnel. HCFA also collects cost information from the Medicare Provider Cost Reporting Form (HCFA 1450 or UB-82 Form).

Data are available from several professional organizations that periodically conduct sample surveys of home health agencies and the services they provide. The primary non-federal agency is the National Association for Home Care which generally collects data in response to legislative mandates from their members. Two national nursing organizations, the American Nurses' Association and the National League for Nursing, collect data for specific nursing-related home health issues.

4. RESEARCH AND DEMONSTRATION METHODOLOGY

Conceptual Framework

The research described in this report was directed toward developing a home health classification method for predicting resource requirements and measuring outcomes. To achieve this objective, the conceptual framework shown in Figure 4.1 and methodology shown in Figure 4.2 were formulated to guide the approach to be taken. The conceptual framework evolved from the statement of the problem, review of the literature, and the results of an earlier pilot study that was conducted.

The principal assumption for the conceptual framework and methodological research was that by collecting a large volume of data on Medicare patients and resources used for their home health care, a classification method could be designed to predict their care requirements. This would require a national sample of home health agencies and a sample of their Medicare patients. Data would be collected retrospectively using an assessment instrument. Then, through multivariate analyses of these data, the relationship between patient characteristics (independent variables) and uses of home health services (dependent variables) as measured by number and timing of visits would be assessed.

Criteria for a valid and reliable classification method:

- Address total patient requirements for all types and levels of skills and services, and differentiate those items for which Medicare was responsible so that Medicare-covered resource requirements could be separately priced.
- Be based on assessment of critical indicators of care requirements, not on services actually used.
- Group patients with homogeneous requirements. Variation of requirements within classes would be minimized while variation among classes would be maximized.
- Be based on valid and reliable measurements.
- Be sufficiently flexible to allow substitution of qualified staff when required occasionally by local circumstances, e.g., a registered nurse who performs certain rehabilitation services when a physical therapist was unavailable.

- Be used for multiple purposes: reimbursement, planning, evaluation, staffing and quality assessment.
- Be applicable to all types and sizes of agencies offering home health services.
- Have the sensitivity to account for changes in case severity mix.
- Be easy to understand and inexpensive to use and manage.
- Be integrated into the ongoing record-keeping system of home health agencies.

Pilot Study

A pilot study was conducted to clarify the conceptual framework and methodological approach and to obtain insights into possible variables that could serve as indicators of resource requirements. It was conducted in two home health agencies -- a visiting nurse association (VNA) and a proprietary home health agency. Both were certified and both provided a comprehensive home health care program. A form was developed to abstract patient data from the agencies' records. Data were collected on a large number of variables that were conceptualized as influencing resources required and used.

The measure of resource use was determined by the number of visits made by the various providers and by the medications, medical supplies, and equipment used. The major variables included:

- Demographics: age, marital status, race, sex, education, socio-economic status, language proficiency
- Payment source and source of referral
- Social and environmental conditions: safety measures, informal and secondary care-givers
- Clinical data: principal diagnoses, surgical procedures, nursing problems, and orders for treatments, services and medications
- Functional capabilities and activity status
- Mental status
- Prognosis
- Status at discharge and final disposition

The sources of data were the agency's own records including the three HCFA forms introduced to collect standardized data for reimbursement of home health services by Medicare: (a) Home Health Certification and Plan of Treatment (HCFA Form 485), (b) Medical Update and Patient Information (HCFA Form 486), and (c) Plan of Treatment/ Medical Update and Patient Information Addendum (HCFA Form 487). Inclusion of these

forms meant confining the study to Medicare patients and to only those admitted after the HCFA forms were introduced. A total of 220 records were abstracted on discharged patients for entire episodes of care from admission to discharge.

Pilot Study Conclusions

The pilot study was an invaluable guide to the design of the research project. Many useful insights were obtained concerning the sources of data, sample size and composition, and potential variables for inclusion in the research project. The pilot study also provided guidance on how best to operationalize the project tasks.

The major conclusions and recommendations from the pilot study were:

- Existing records of a home health agency can provide data on significant variables that affect services provided.
- Medicare forms, HCFA 485, 486, and 487 provided useful data.
- Several variables appeared to be related to resource use.
- Because resources used may not precisely reflect resources required, a Panel of Experts would be needed to assist in the refinement and validation of the classification method to predict resource requirements.
- Single independent variables could explain the variation in the dependent variables, but the explanatory power of combinations of independent variables appeared to be considerably greater.
- Data existed that could be used to measure outcomes.
- The Abstract Form used in the pilot study was effective and user friendly, and could be used in the project with modification based on additional refinement and testing.

Conceptual Issues

The research focused on five major conceptual issues which were addressed to operationalize the conceptual framework and methodological approach for conducting the project. They include:

- Structure and Content of Assessment Instrument
- Reconciliation of Resource Use and Requirements
- Structure and Content of Classification Method
- Structure and Content of Outcome Measurement Instrument
- Enhancing the Applicability of the Classification Method

Structure and Content of Assessment Instrument

Much work has been done in the development of assessment instruments for basic data systems for home health agencies. The instruments are designed to provide multidimensional data on patient characteristics and needs relevant to the planning and management of care. These data generally include the variables for which data were collected in the pilot study. The pilot study provided valuable information on data availability in the patient record of a home health agency. The Abstract Form was structured to contain elements that adequately captured the data in these records and provided an in-depth description of patient characteristics, and medical and nursing needs. It was designed to serve as the basis for an assessment instrument.

Reconciliation of Resource Use and Requirements

Figure 4.1 displays how data on various characteristics of home health patients could be processed into measures of resources required to provide needed services. Terminology such as requirements and needs implies standards prescribing the quantity and quality of services and other resources that should be given to patients to attain certain predetermined goals. Because scientifically based standards do not generally exist, professional judgement usually determines the specific clinical goals and the resources needed to attain the goals on a case-by-case basis.

In the absence of standards developed from experimentally derived data that specify the amount of care required by a patient to achieve certain predetermined outcomes, it was necessary to rely on empirically collected data that showed the amounts and types of care actually provided to such patients and the changes in their status that resulted. Such normative data, averaged for large numbers of patients, could provide meaningful guidelines for allocation of resources as well as for planning, budgeting, staffing, and evaluation.

Structure and Content of Classification Method

While the exact specifications of the classification method were unknown, a preliminary conceptualization was made of its essential characteristics based on work that was done previously. Although many classifications of patients exist, few are scaled according to resource use and fewer still, according to resource requirements. The DRGs are an example of a use-driven classification of patients in acute care hospitals. The RUGs II classification for long-term care patients contains the following classes, called hierarchy groups: special care, rehabilitation, clinically complex, severe behavioral

problem, and reduced physical functioning. These are further subdivided into 16 groups according to an activities of daily living scale. In both the DRGs and RUGs II methodologies, weights are provided for each of the classes denoting resource consumption. These are essentially relative values and are geared to total resource use rather than specific provider categories.

The development of a classification instrument for resource requirements is analogous to item analysis. A universe of items (variables) is assembled. Data on the variables are obtained from a sample of respondents and are initially analyzed through such techniques as factor or cluster analysis that screen the variables to reduce them into a set of discrete indicators. The reduced set of variables are then tested for reliability (consistency) and validity (construct, content, predictive).

The pilot study yielded important clues concerning relevant independent variables. The critical test of the validity of the indicators was their ability to predict the consumption of resources that accurately reflected resources required. Moreover, it was important to arrive at a classification tool that had clinically relevant and meaningful categories.

Structure and Content of Outcome Measurement Instrument

An important goal of this project was to develop an outcome measurement tool that would be an essential component of the resource requirements prediction method. Outcome measurements serve not only to monitor and validate the assessment and classification tools, but also to form the basis for a much needed quality assurance program for home care agencies. Quality assurance is a guarantee by agencies to their consumers that certain performance standards and clinical goals are being met.

Traditional approaches to the measurement of quality of health care have addressed the structure, process, and to a far lesser extent, outcome dimensions. Structure refers to the characteristics of the setting (facility) in which care is provided, including staff, and services are available, etc. Process refers to what was done to or for the recipient of services with respect to the particular health problem for which care is provided. Outcome refers to what finally happened to the recipient of services in terms of the particular problem for which care was provided. Clearly, of the three dimensions, outcome has the greatest relevance and importance. Linked to structure and process, outcome measures the effectiveness of services provided. Some home care agencies are beginning to turn their attention to outcome-focused quality assurance assessments which currently are in a primitive state. These agencies obtain data at the conclusion of the episode of care on a few outcome indicators such as final disposition of the patient and the extent to which initial goals were met.

The development of an outcome measurement tool begins with delineating meaningful outcome criteria. Figure 4.1 contains a preliminary list of such criteria. Processing these criteria into quantitative indicators, providing valid and reliable measures of outcomes was a major task of the project. For some criteria this task was relatively straightforward and uncomplicated. Activities of daily living (ADLs) are a widely used criterion for which reasonably good quantitative measures have been developed. Although measures are not available for many other criteria, for the most part they represent objective behavioral characteristics that simplify the task of designing appropriate measures.

Another important aspect of the measurement of patient outcomes is the ability to evaluate changes in patient status by comparing status at the beginning and end of the episode of care. The Abstract Form that was developed in the pilot study was structured to contain elements which incorporated the outcome measurement criteria so that changes could be evaluated by obtaining data at the beginning and conclusion of service for a before and after comparison.

Enhancing the Applicability of the Classification Method

The project was guided by the need to develop a method that has wide applicability among all home health care agencies certified for Medicare. Every effort would be made to ensure its widespread applicability by evaluation of the method at every step of its development by the Panel of Experts in terms of its suitability for dissemination to the broad spectrum of home health agencies. Figure 4.2 displays the linkage of major tasks that were recommended to be in the project implementation.

Sample Design

The conceptual framework and methodological approach for the research underscored the need for designing a national sample from which to collect study data. Two issues had to be considered in designing the sample. First, the agencies and patients selected to participate in the project should be representative of the total universe of agencies and patients. It was considered impractical to select patients in a strictly random manner. Second, the national sample should reflect home health services existing in different areas of the country. A two-stage design (Appendix 4.1) was proposed: (a) selecting a national sample of agencies and (b) selecting patient records within each agency.

It was originally proposed that the national sample consist of 100 HHAs selected through a random process. It would be disproportionate by weighing the sample with larger agencies but would maintain representation through the stratified variables. It was assumed that each national sample agency would abstract 100 patient records totalling

10,000 cases. However, based on initial inquiry this was not realistic since the agencies themselves would be responsible for collecting the data, rather than the project staff. It was decided that the burden on the agencies had to be minimized, thus, the number of agencies were increased and the number of cases for each agency reduced to whatever each agency agreed to collect.

A revised national sample of 400 certified home health agencies (HHAs) was finally considered to be more realistic. These agencies would be selected by dividing the universe of HCFA certified agencies into 16 strata according to four types of agency ownership: (a) visiting nurse associations, (b) official agencies, (c) hospital-based agencies and (d) private agencies; in, four geographic locations in the United States: (a) North, (b) South, (c) MidWest and (d) West.

The number of agencies selected from each stratum was made proportional to size of strata, where size was measured by the number of full-time-equivalent (FTEs) registered nurses (RNs) employed. Agencies were classified as having a staff size of (a) greater than one to less than 5 FTE RNs, (b) 5 to less than 14 FTE RNs, (c) 14 to less than 65 FTE RNs, and (d) 65 FTE RNs and over.

Within each stratum, agencies were to be selected with probability proportional to agency size with the exception of 28 large agencies employing over 100 RNs which were automatically included in the sample. In addition, four matching agencies were to be identified for each of the agencies except those over 100 RNs, since some might be unable or have to decline to participate in the project. A match was defined as being in the same stratum and close in size to the agency selected. As a result a five level sample frame of approximately 400 HHAs were to be randomly selected for the universe of HCFA certified HHAs.

Figure 4.1

Conceptualization of process for predicting resource requirements and determining outcome measurements for home health patients

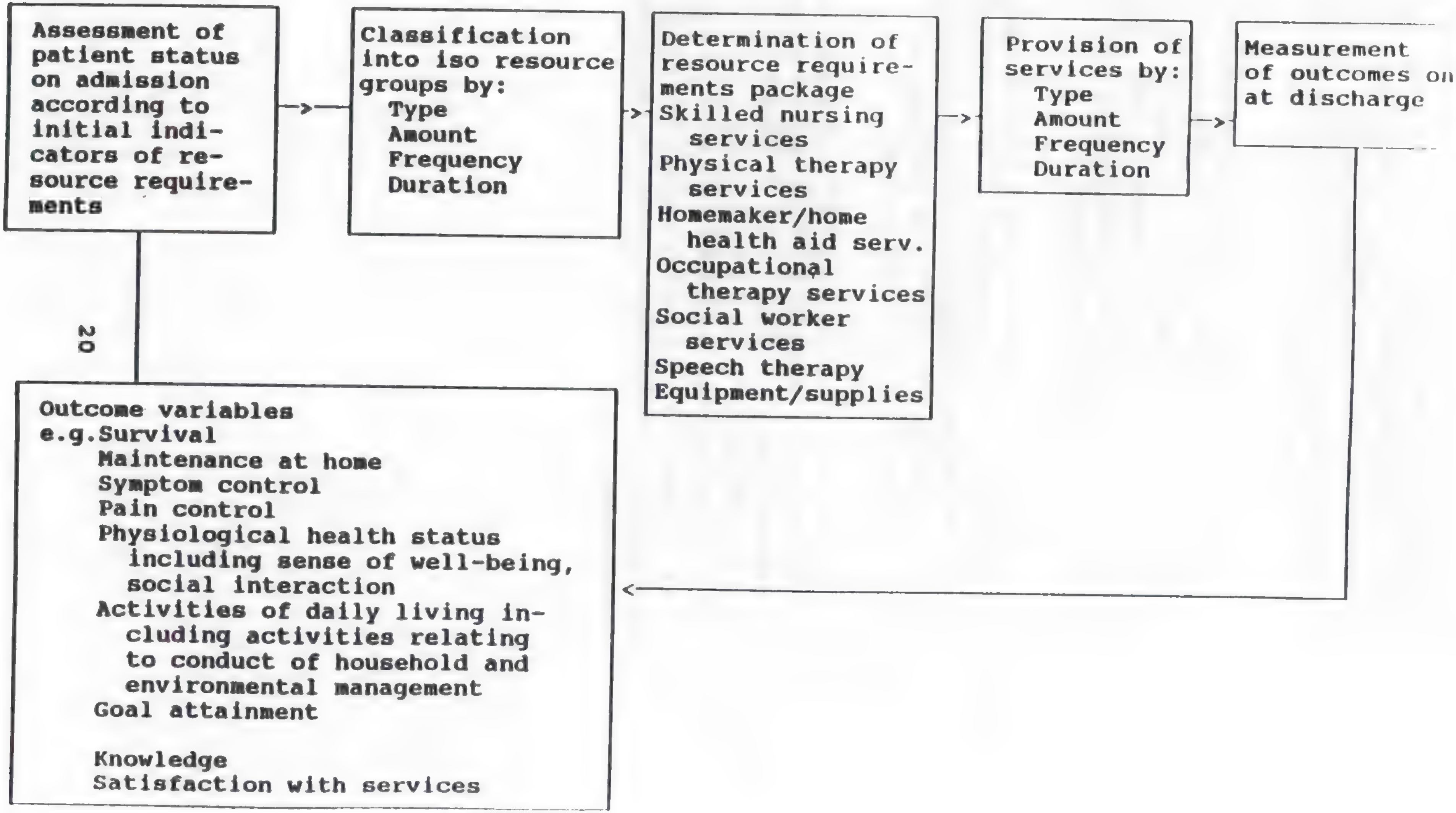
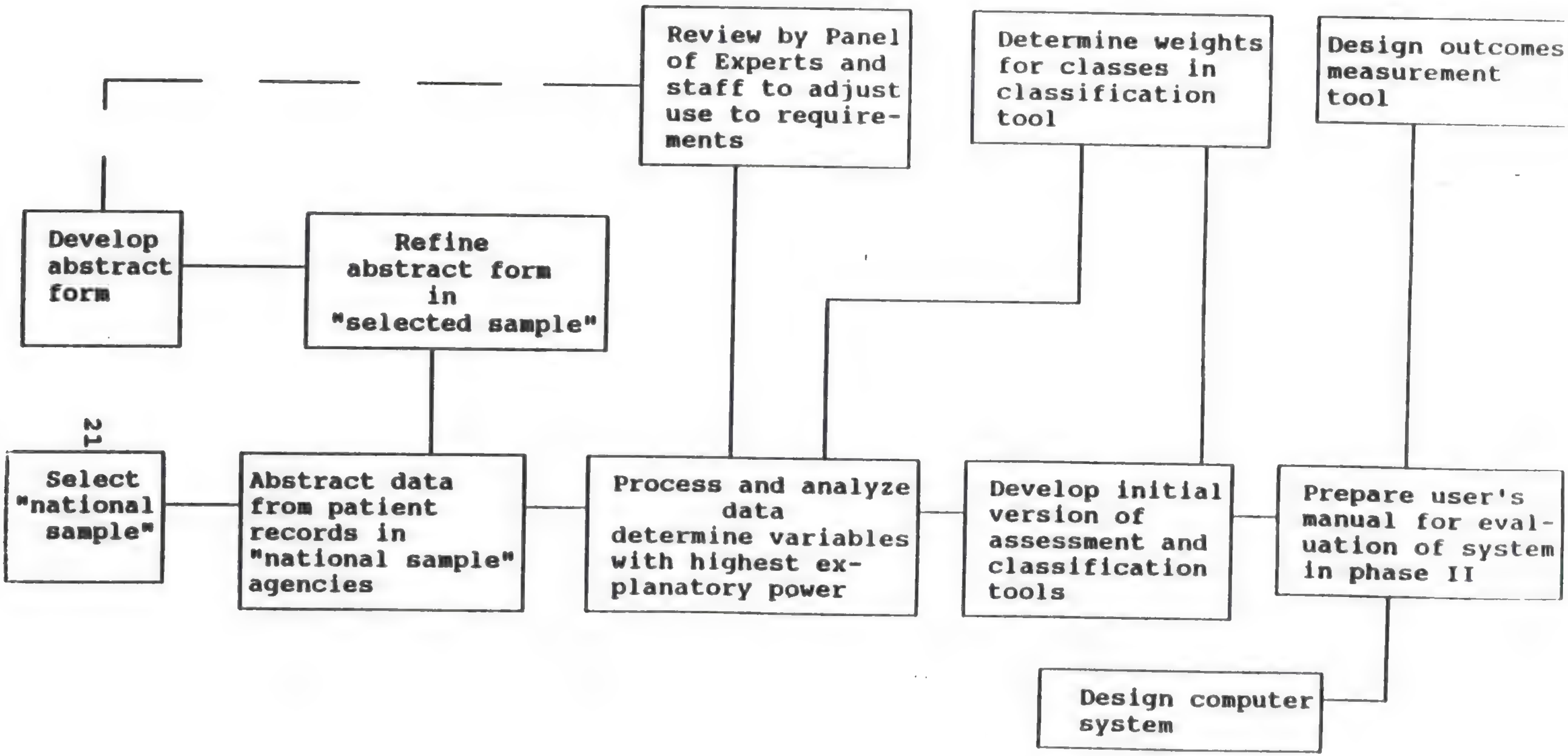


Figure 4.2

Linkage of major tasks to be performed in phase 1



5. RESEARCH PROJECT

The research project was guided by the need to develop a classification method that would have wide applicability among all home health agencies (HHAs) providing home health services to Medicare patients. The research methodological approach was based on a small pilot study conducted prior to the project.

The research project, which began in 1987 was conducted over a three-year period, one year longer than the proposed time frame of two years. The revised research plan, outlined in Appendix 5.1, provided a framework for this major effort. In addition, the milestone chart shown in Figure 5.1 highlights the major tasks conducted and their approximate time requirements.

Operationalization of Project

The project office was established at the Georgetown University School of Nursing. It provided sufficient space to house the project staff and was equipped with computer stations.

The initial project plans were presented at the National Association of Home Care (NAHC) annual conference held in Washington, D.C., in 1988. Individuals were solicited to participate along with a letter of invitation to approximately 350 home health agencies of which 200 directors expressed interest in participating.

The Georgetown University Public Relations Department submitted news releases regarding the project to selected nursing journals, Georgetown University Medical Center Grant News, and the NAHC Newsletter which featured the goals of the project (Appendix 5.2 for selected news releases and abstract). A research project abstract was developed as a handout for general distribution.

National experts were selected and appointed to provide external review at critical times in the life of the project. The Panel of Experts (Appendix 5.3) consisted of approximately twenty clinical home health nurses, home health agency directors, and research methodologists.

Development of Abstract Form

One of the major tasks of the project was the development of an Abstract Form to collect the data necessary for developing the home health classification method. The form was also designed to collect all relevant variables considered to be possible predictors of home health care as well as data on the actual services rendered for the patient's most recent episode of home health care from admission until discharge.

Initially, the Panel of Experts recommended that a comprehensive set of relevant variables descriptive of Medicare patients receiving services from home health agency providers be included. These variables included functional status, socio-economic characteristics, medical diagnoses and surgical procedures, nursing diagnoses and patient problems, usages of services and other services provided.

The Panel also recommended that the Abstract Form focus on four areas:

- Descriptive variables related to: (a) structure of the agency: size, ownership, income/expenses, services provided; and (b) the patient: age, sex, marital status, living arrangements, etc.
- Variables related to resources required: patient health status, nursing and medical problems, and orders for services.
- Variables related to actual resource use: number of visits, length and duration of services.
- Variables related to assessment of outcomes: health status variables that indicate changes from admission to discharge.

The initial Abstract Form was based on an adaptation of the form used in the pilot study. Other variables were added based on the review of the literature, as well as recommendations from members of the Panel of Experts. The Abstract Form also included variables available from most home health agency patient records, such as selected variables from the newly instituted HCFA 485, 486, and 487 Forms. The variables were then assessed and evaluated for their quantitative properties – scales, weights, and scores – in order to determine their applicability for analysis.

A separate Panel of Nursing Experts was also convened to make further recommendations. These experts recommended that the entire discharged patient record be abstracted and that the retrospective data to be collected reflect the care provided to the patient for an entire episode of care. This would include data on all patient problems/ nursing diagnoses and nursing services (interventions, treatments, procedures, and other activities). Further, they stated that the patient problems (or nursing diagnoses)

and nursing services should be abstracted and recorded as narrative descriptions on the Abstract Form. This additional effort provided a complete and in-depth summary of the care process.

Preliminary Abstract Form

The first cut of the Abstract Form was completed and pretested in fifteen home health agencies in various parts of the nation, listed in Appendix 5.4. Pretest data were collected from approximately 200 discharged Medicare patient records by the project staff nurses, agency nurses and members of the Panel of Nursing Experts.

Throughout the pretest, a close relationship was maintained with those agencies to determine the reliability of data, ease of use of Abstract Form, length of time to complete the Abstract Form for a single patient record, and the variables that presented difficulties. Data from the pretest agencies were analyzed for (a) reliability (b) relevance of variables as predictors of resource requirements and measures of status changes (outcomes), and (c) application of analytic techniques for assessing the predictive power of variables and for determining statistically distinct and clinically relevant classes.

Final Abstract Form

The final Abstract Form was based on analysis of the data from the pretest agencies which was further refined and retested. It was precoded for data processing and contained an explanation of purpose of the study, definitions of variables, and instructions for completing the form. A total of 15,000 copies of the final abstract form, shown in Appendix 5.6 with its instructions, were printed.

The Abstract Form was designed to collect 73 variables considered to be possible predictors of resource requirements in home health care and critical to the project. It was designed to abstract data for an entire episode of care from admission until discharge from the admission form, intake form, nursing assessment and nursing diagnoses forms, plans of care forms, visit forms, nursing services forms, progress notes, outcomes of care notations, and discharge forms. Billing and cost data were not collected because these data are not routinely found in the patient record.

The data were to be collected from all forms in the patient record and by questioning the primary nurse for data not found in the record. The primary nurse is responsible for managing the home health care, supervising the auxiliary providers and making referrals to other providers for specialized care. This nurse is also responsible for documenting the care process and completing all forms required for the patient record.

Development of the Agency Information Form

An Agency Information Form was also developed. This form was designed to capture basic data on the characteristics of the participating home health agencies: size, organization, structure, location and type of provider including the services offered (Appendix 5.6).

The major purpose of the form was to link the patient records with the home health agencies providing the services. It was assumed that other detailed home health agency data could be obtained from the HCFA database.

Selection of Sample Agencies

It was originally proposed that the project sample be derived from the universe of Medicare certified home health agencies. As a result, a random sample of home health agencies was developed that stratified the universe of agencies by size, type and geographic location. Five separate sample levels of approximately 400 HHAs were chosen, four of which were to serve as back-up for the non-respondents.

HCFA provided the project with the Medicare and Medicaid Automated Classification System (MMACS) computer tape containing information on approximately 5,880 Medicare certified agencies as of 1986. Some 113 very small agencies (those with less than one FTE RN) were deleted because they were judged not to provide professional services directly to patients but rather were organized for purposes of meeting regulatory requirements. The remaining 5,767 agencies comprised the universe from which the national samples were selected. The provider numbers of the agencies were matched with the HCFA MMACS in order to obtain the names and addresses so that the agencies could be solicited for participation in the project.

Each of the five levels consisted of approximately 372 home health agencies by provider number. They were selected from each stratum based on type of ownership and demographic location proportional to size of strata where size was measured by the number of full-time equivalent RNs employed. Within each stratum, agencies were selected with probability proportional to agency size with the exception of 28 large agencies employing over 100 RNs.

To deal with the potential problem of a randomly selected agency declining to participate in the study, the matching agencies were identified in each of the five levels. A match was defined as being in the same stratum and close in size to the agency first selected. It was also proposed that 25-100 patient records of cases be abstracted from

the first level of approximately 400 agencies to obtain the total of at least 10,000 cases. The three strata used for the national sample selection were: (a) size of agency staff, (b) type of ownership, and (c) geographic location.

Size of Agency Staff

The stratification variables were selected proportionate to agency size or number of full time equivalent registered nurses (FTE RNs) as follows:

- Over one to less than five FTE RNs
- Five to less than 14 FTE RNs
- 14 to less than 65 FTE RNs
- 65 FTE RNs and over

Type of Agency Ownership

The organizational structure, mode of operation, and type and mix of personnel were deemed critical to the sample design. The nine agency types were identified by HCFA were collapsed to four based upon organization similarities. In addition, some types contained too few agencies for a meaningful sample to be drawn, e.g, Rehabilitation-based facility with only 34 agencies. The final four types were:

- Visiting Nurse Associations/Voluntary agencies
- Official Health Departments/Combination Agencies
- Hospital-Based Agencies/Rehabilitation/Skilled Nursing Facility Programs
- Private Non-Profit/Proprietary Agencies

Geographic Location

Because of the large number of agencies being sampled and the need for stratification by geographic location, it was decided to aggregate the ten DHHS regions into four divisions similar to those of the U.S. Census Bureau. A map (Figure 5.2) shows the divisions. They are as follows:

- North: Regions 01, 02, and 03
- South: Regions 04 and 06
- Midwest: Regions 05 and 07
- West: Regions 08, 09 and 10

Selection of Sample Patient Records

A sampling plan for selecting patient records, called cases, was included in the instructions to the participating agencies. A simple random method was suggested.

The project coordinators in each project agency were instructed to review a set of recently discharged Medicare patient records for any specific time interval with a representative caseload. They were to determine the percent of cases they would abstract and then randomly select them via a simple systematic method. For example, if an agency had 50 records discharged in the last one month period, and had agreed to abstract 10 patient records, then they would abstract every fifth patient record.

Solicitation of Sample Agencies

A solicitation packet was prepared for distribution to all agencies in level one of the sample frame. The packets were sent to approximately 400 agencies each with a staff size of 65 FTE RNs. The solicitation packet contained: (a) Letter of Solicitation, (b) Project Abstract, (c) HCFA Letter of Support, and (d) Agency Response Form (Appendix 5.5).

It was subsequently determined that the original set of 400 agencies could not provide sufficient patient records to obtain the project goal of 10,000 cases. Therefore, all agencies in the remaining four levels of the five-level sample frame selected as matches to replace the agencies who gave negative responses were also solicited. This was necessary in order to solicit enough agencies to obtain the research sample of 10,000 cases. A total of 1,598 agencies were solicited of which 788 agreed to participate.

Several steps were taken in an effort to secure as large a participation as possible. Further, the agencies that agreed to participate were encouraged to provide as many cases as possible. Follow-up included: (a) contact by the State Directors of Home Care Associations; (b) announcements by the National Association of Home Care (NAHC); (c) telephone contact by project staff; and (d) specific mailings of additional project materials.

Distribution of Project Materials

Project materials (Appendix 5.6) distributed to each home health agency that agreed (either by phone or mail) to participate included the following:

- Cover letter: this was a special cover letter from the Principal Investigator which contained instructions and general information about the project. It included the toll-free telephone number that could be used for technical support and the date on which the completed Abstract Forms were due.

- Agency Information Form: an Agency Information Form was developed specifically for the project. This form was to be completed by the agency in order to provide general information about its size, type, location, type of personnel, and services provided.
- Instruction Sheet: an Instruction Sheet (two sided) was developed that contained instructions on how to randomly select the recently discharged Medicare case records to be abstracted. It also contained rules for confidentiality of patient data, making edit checks for accuracy and completeness, and forwarding forms for data processing.
- Abstract Forms: each agency received the number of forms it requested, and an additional one for their agency files.
- Envelopes: an appropriate number of pre-addressed postage paid return envelopes to return completed forms to project office.
- A letter of support from HCFA.
- Statement of confidentiality of patient data.

Collection of Data

Data collection was performed by agency staff who abstracted data from patient records. These varied from agency to agency. In most agencies a clinical nursing supervisor was responsible for the project materials. It was estimated that it took approximately one half hour to abstract one patient record or case. In addition, the primary nurse provider was interviewed for information not available from the patient record such as activities of daily living.

Follow-up Support

Toll-free telephone support was provided throughout the collection phase in order to provide technical support to agencies. The National Association of Home Care (NAHC) also provided follow-up support during the project. NAHC distributed a list of all agencies in the national sample to State Directors of Home Health Care for each of their respective states, who provided support by contacting and encouraging agencies to participate.

Follow-up Mailings

Reminder letters and resolicitation packets, where needed, were sent to ensure a database of 10,000 Medicare patient records, the project goal. Letters of thanks were sent to all participating agencies when all project materials were received (Appendix 5.7).

Reliability Testing

Early in the data collection process, it was planned that a reliability check be initiated to ensure reliability of the abstracting process in sample agencies. However, based on several attempts by the Project Director to double code patient records in several different agencies, this check was suspended because the organization and structure of the patient records varied considerably from agency to agency and did not coincide with the items on the Abstract Form. Further, it was difficult to interpret and abstract the narrative progress notes in the patient records even if the primary nurse, who was familiar with the case, was interviewed. Moreover, participating agencies expressed concern that reliability testing appeared to evaluate the care provided by agency personnel and created stress among the HHAs staff.

There was concern that this activity could have dissuaded other agencies from participating. Finally, there was concern that double coding could somehow be viewed as violating patient confidentiality. Thus, other ways of enhancing the reliability of data were initiated during the data entry and edit phases.

Figure 5.1

Milestones chart for home health care classification project: Date and type of task

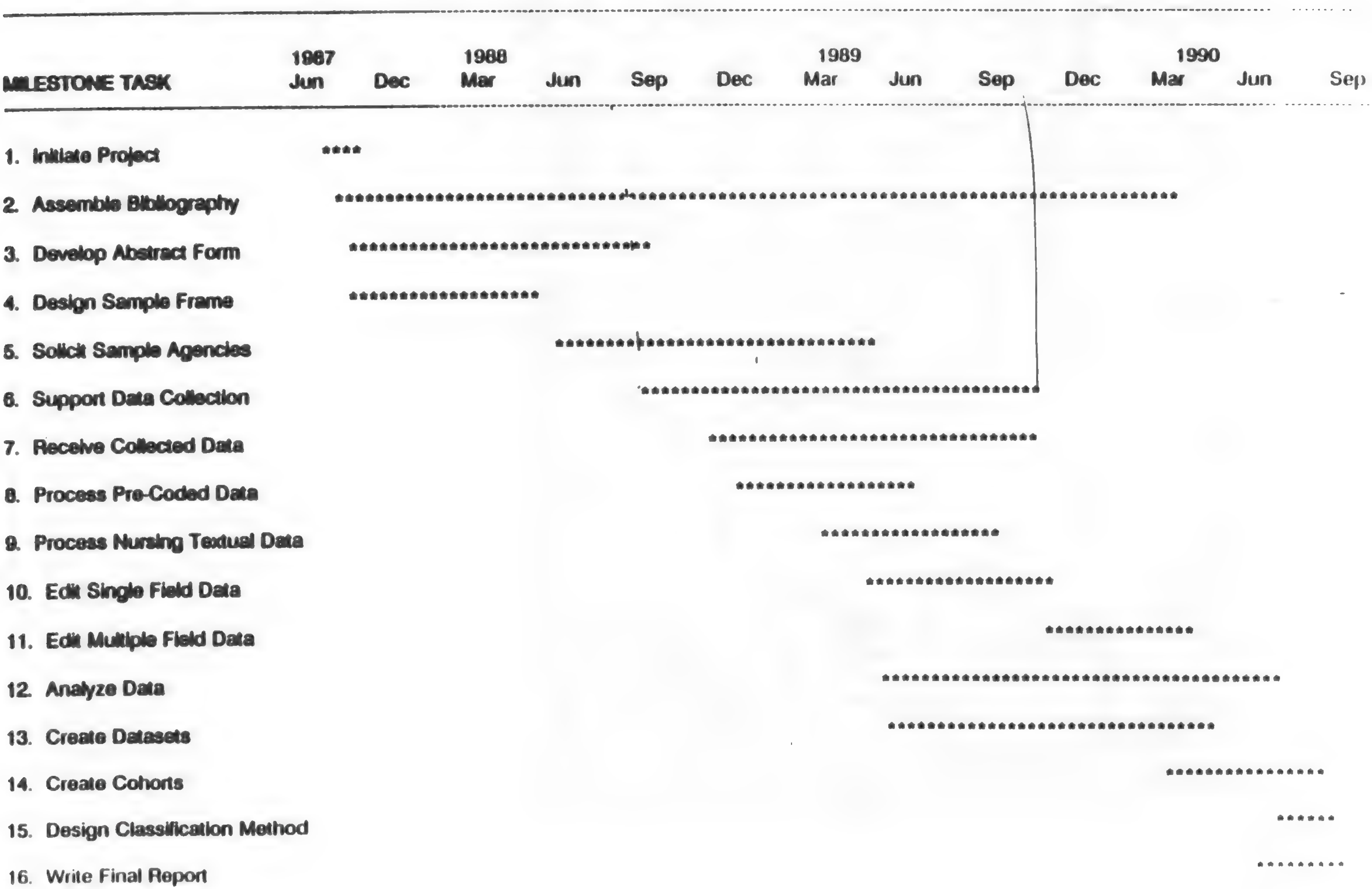
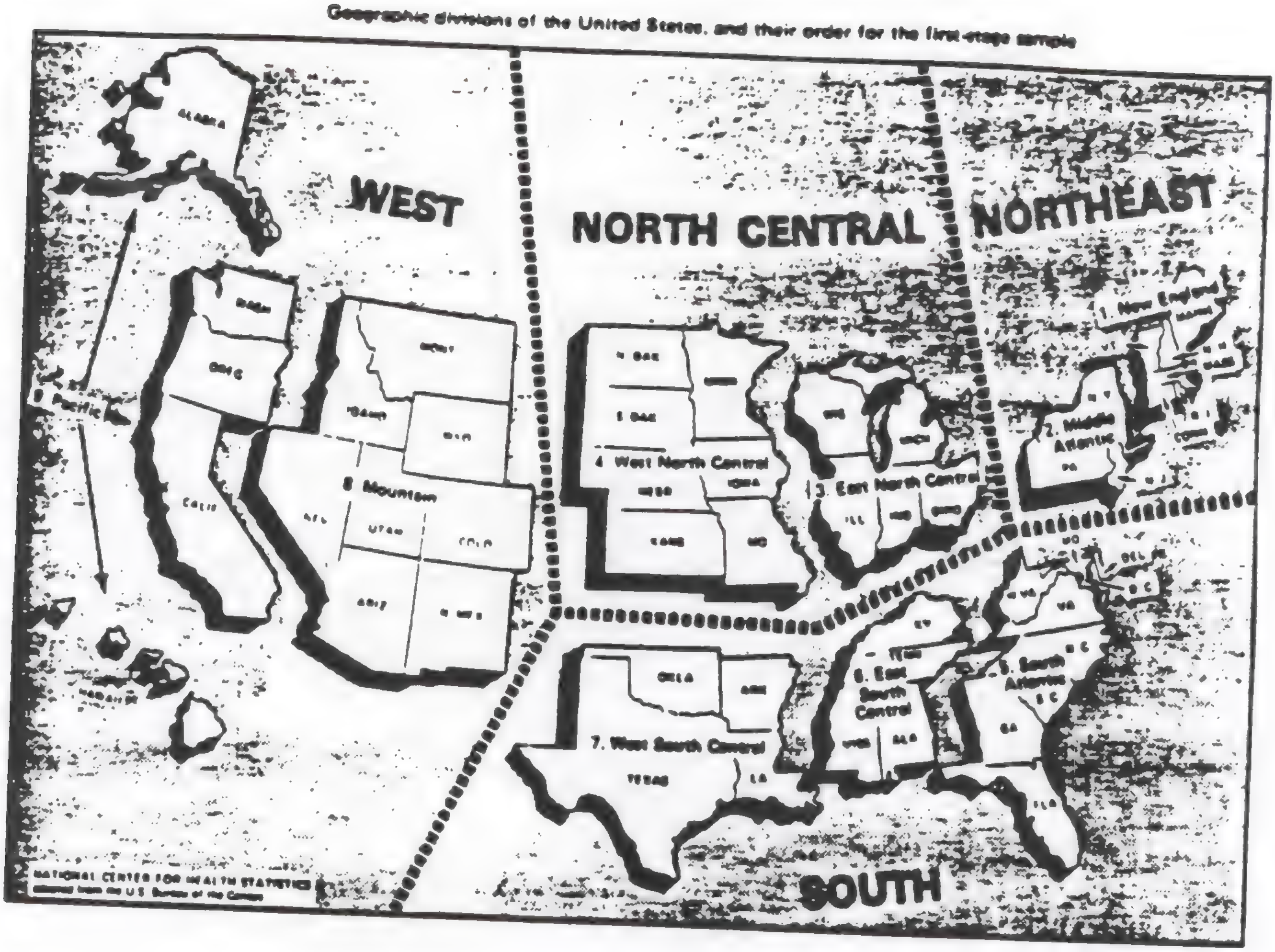


Figure 5.2

Geographic divisions of the United States, and their order for the first-stage sample



6. DATA PROCESSING

The assembling and processing of the data in preparation for analysis constituted a major effort. It encompassed all activities from the time the completed Agency Information Forms and Abstract Forms were logged at the project offices until they were processed into the computerized data sets ready for statistical analyses. An overview of the major steps follows.

Abstract Form Submissions

All sample returns, which included the Abstract Form and Agency Information Form, were checked for completeness by project staff. The returned forms were then logged into the Agency Tracking System which was used to track the data and assist with follow-up procedures. If discrepancies existed, they were placed in a follow-up problem file. They were tracked and followed up, and-all problems were resolved prior to being data processed.

Logging Forms

The returned Agency Information Forms and Abstract Forms were logged into a computerized tracking system, which used Advanced Revelation, a microcomputer database management system. This system was designed to track the status of the forms, such as the number of forms distributed to and received from agencies, number of forms sent to and from data entry unit, and the number of forms requiring some type of error checking. It also contained the status of agencies that failed to return their forms including follow-up, late submissions, and forms with incomplete or missing data. Summary statistics were generated periodically in order to ensure the goal of collecting 10,000 abstracted patient records for the project sample cases.

Agency Information Form

A total of 646 home health agencies from the 788 agencies who agreed to participate in the project returned Abstract Forms. Each agency submitted between 5 and 50 completed Abstract Forms. The Abstract Forms were linked and matched to each agency making it possible to process data in cases by agency characteristics.

Abstract Forms

A total of 8,967 Abstract Forms were logged-in. These forms were stamped with a unique control number in at least two places on the front sheet and on the second page, and then placed in a unique agency folder. The front sheet was removed and filed in a separate locked cabinet to ensure patient confidentiality.

All Abstract Forms were stored by agency, compiled in combinations of 200 (or batches), and logged out via the tracking system with a control sheet for keyboarding.

Database Design

Database design required a major effort due to the complexity of the Agency Information Form and the patient Abstract Form. Data entry was performed by data entry clerks who keyed all data into a computer database. The database was designed for easy manipulation of the file structures and datasets for the statistical analysis.

Agency Information Database

The data from the Agency Information Forms were entered into a microcomputer database using the database management software package called Advanced Revelation. They were stored in the project office microcomputer's database and were coded and linked to the Abstract Form data.

Agency Information Forms of agencies with sub-units presented the greatest difficulty. However, when an agency sub-unit had a unique Medicare provider number it was treated as an individual agency regardless of the agency organization. For example, several state and local health departments had separate provider numbers even though the local health departments were sub-units of the state. Some proprietary chains had overlapping main and local offices, but because they were located in different states they had different provider numbers. As a result, the 646 participating agencies included 28 sub-units as separate agencies.

Abstract Patient Records Database

A plan to enter the data from the completed Abstract Forms was finalized after evaluating two options for keyboarding the data into a computer system. They included either negotiating a contract with an outside vendor, or using one of the data processing facilities on campus. The method chosen, which met acceptable project costs and provided high levels of accuracy, utilized an existing data entry staff at the Georgetown University Medical Center. The coordination and supervision of data entry was conducted

by the unit director who was also the project's analytical director. Further, the unit was responsible for developing computer programs necessary for building data files for the statistical analysis.

Data Entry

Data entry procedures were tested with approximately 200 Abstract Forms and determined to be acceptable. Five types of data were entered into the computerized database from the 73 items on the Abstract Form. They included various levels of precoded data:

- Single field data
- Multiple field visit data by all health care providers
- Multiple field service data by all health care providers
- Multiple field data for nursing diagnoses
- Multiple field data for nursing intervention
  (Codes manually recorded by project staff for narrative text)

Five other steps identified as critical to data entry included:

- Single entry of all data, except nursing diagnoses and nursing interventions
- Fixed field verification by double data entry
- Sight verification of double visit data entry
- Verification of nursing diagnoses/patient problems and patient services (procedures/treatments) codes by project staff
- Sight verification of nursing diagnoses and nursing interventions data entry
- Computer corrections of logical data entry errors

The Abstract Form data were stored on a microcomputer located in the data entry unit at the Medical Center and connected to the Project Office via the ISN communication hardware (local area network) and a communication software package known as Procomm. The data from the Agency Information Form were stored on the project office's computers.

Coding of Textual Data

The Abstract Form was precoded except for two narrative sections: (a) item 46: Nursing Assessment of Patient Problems/Nursing Diagnoses, and (b) Item 44: Professional Skilled Nursing Services (Treatments/Activities/ Interventions). Both required a method for coding the narrative descriptions that addressed a complete array of textual data. Two different schemes were created to carry out this process.

Patient Problems/Nursing Diagnoses

The selection of a scheme to code the narrative text describing nursing assessment of patient problems and/or nursing diagnoses required several sequential steps in order to prepare the data for analyses. Initially, narrative text from the first 1,000 cases were keyboarded and analyzed using several keyboard sorts. Based on the frequency of the sorts, it was determined that the Classification of Nursing Diagnoses based on the North American Nursing Diagnosis Association (NANDA) Taxonomy I (Fitzpatrick, et al., 1989) was preferable to the Omaha Problem List (Simmons, 1980).

This decision was followed by actual testing of the scheme on several hundred cases to determine if Nursing Diagnosis Taxonomy I could be adapted for coding the narrative data in this section. Based on consultation from nursing diagnosis experts, it was found to be usable if adaptations were made. The Nursing Diagnosis Taxonomy I was adapted and expanded to accommodate the narrative descriptions as recorded by the abstractors from the 646 home health agencies. Over 40,000 nursing diagnoses were initially coded for approximately 9,000 sample cases.

The adapted coding scheme (Appendix 6.1) consisted of 147 codes (42 two digit major categories subdivided into 105 three digit subcategories). The coding structure was similar to the Ninth International Classification of Diseases (ICD-9-CM, 1980). That is, the first two digits represent major categories followed by 3 decimal places for the three digit subcategories.

Patient/Nursing Services

The coding of nursing services consisted of two different coding schemes: (a) the predefined HCFA Treatment Codes for Home Health Services (Appendix 6.1), and (b) a newly created list of home health nursing interventions specially designed for the project.

The HCFA Treatment Codes for Home Health Services were used to collect those skilled nursing services identified by HCFA as reimbursable. The codes, A1 - A27, circled on the Abstract Form, were keyboarded and merged with the second scheme of codes.

The second scheme was specifically developed to code the skilled nursing services that were recorded as narrative descriptions. These skilled nursing services included treatments, activities, and interventions that did not have a HCFA code.

Since there was no available coding scheme for home health nursing interventions found in the literature, one was developed. It emerged through a series of sequential steps designed to code the narrative nursing services data in preparation for statistical analysis. The textual descriptions from the first 1,000 cases were initially keyed into a computerized database as means of determining common terms. By using permuted keyboard sorts, like terms were sorted and clustered. For example:

> Instruct Safe Mobility and Teach Safe Ambulation were clustered two ways: (a) Instruct and Teach with common term Safe; and, (b) Mobility and Ambulation with the common term Safe.

Hundreds of other keyword sorts were analyzed. By using this technique a tentative list of nursing interventions, comprised of approximately 800 possible discrete nursing services. However, when pilot testing the list on live data, it was noted that there were two aspects to a nursing services description–the service itself and the type of action modifying it.

Four different nursing actions appeared over and over again which focused on: (a) patient assessment, (b) direct service, (c) teaching or educating, and (d) management and referral of home health nursing services. The nursing actions were categorized as follows:

> Assess: collects and analyzes data on the health status
> Care: performs a therapeutic action
> Teach: provides knowledge and skill
> Manage: coordinates and refers

By using different codes to depict these four actions the list of nursing interventions could be reduced to approximately 200 unique nursing services. This strategy of coding two aspects – service and type of action – was also viewed as a means of simplifying the coding process. With further testing and refinement, the list of nursing interventions was finalized and used to manually code the approximately 80,000 textual descriptions. Those codes, in turn, were keyed into a computer to form the nursing intervention database.

The next step in the development of this taxonomy occurred when the coded data were being edited and tabulated. Based on actual frequency counts of the nursing services and nursing actions, the list of nursing interventions that were clinically significant and measurable emerged.

Based on the most frequently used terminology, a preliminary coding scheme was designed, pilot tested, and redesigned through several iterations. The scheme was approved by experts in the field. It encompassed the HCFA treatment codes for skilled nursing services (A1-A27) already on the Abstract Form. The coding structure consisted of four digits: the first two digits represented the major categories, followed by a decimal and a third for subcategories, and a one digit suffix to code the type of nursing action.

The final Nursing Intervention Coding Scheme (Appendix 6.1) consisted of a list of one hundred sixty-six (166) codes, fifty-six (56) of which were two digit major categories subdivided into one hundred ten (110) three digit subcategories. Each of the one hundred sixty-six (166) nursing interventions was modified using one of four types of nursing actions, resulting in a total of six hundred sixty-four possible nursing services.

A total of approximately 80,000 skilled nursing services (treatments, activities, and interventions) were coded for the 8,961 patient records of cases. The total of these skilled nursing services was determined to contain unique discrete data elements.

Data Editing

The Abstract Form required extensive editing procedures. A database was initiated containing data from the first 1,000 Abstract Forms. This database was used as a model for developing several computerized programs to edit the data. This effort consisted primarily of eight editing tasks:

- Identification of disqualifiers
- Review of each record for completeness
- Identification of unacceptable responses
- Management of missing data
- Validation of medical diagnosis codes
- Validation of nursing diagnosis codes
- Validation of nursing intervention codes
- Verification of the visit dates

Data Edit Programs

Computer programs to edit the data were designed to generate error listings of the data that had to be corrected before they could be analyzed. Some errors were reviewed and corrected by the project staff; other errors required follow-up telephone calls to the agencies to review the sample records to clarify or correct errors, omissions and/or problems.

The editing of data from the Agency Information Form used the same process. All data had to be edited before computer analysis could be initiated. To facilitate correction of some errors, special computer programs were written. Data replacement programs were written to correct keyboarding errors such as changing zeros to unknown and inserting a period to represent missing data.

Data correction programs were used to generate several error lists needed to ensure the accuracy and validity of the data. They required either manual review of the individual Abstract Form, and/or telephone follow-up to the agency. A log was generated for each correction list and compared to the Abstract Form to confirm the accuracy of the data edit corrections. The major problems involved:

- Non-Medicare cases
- Non-nursing visit cases
- Cases with admission date after first visit date
- Cases with discharge date prior to last visit date
- Age verification of cases under 65 and/or over 90 years of age.

Detection of Outliers

The cases with different outliers were reviewed and dispositions established for each different variable. For example, the visit dates were reviewed for the extremely long cases, stated ages were compared to birth dates, admission dates to dates of first visit, and discharge dates to dates of last visit. Tight edit controls in the data entry process minimized the need to verify data frequency distributions and histograms. Screening of data for internal validity was necessary and cases with extreme values were examined. Cases with visit data outliers were omitted from the predictor analyses.

Computer Datasets

Computer datasets consisted of the edited data elements suitable for processing by computer using SAS and SPSS statistical software packages. The datasets were designed so they could be transferred for mainframe, minicomputer and large microcomputer processing.

The multiple response questions and the variables were transformed for data processing. Clear labels for variable names and values of codes were entered to make printouts readable.

The following criteria were used to prepare computer datasets composed of records of data element as follows:

- One per patient
- One per visit. Visit data were further analyzed according to the following criteria:
  - Summary of visits by case
  - Total visits by case
  - Provider visits by case
  - Length of episode of case
- One per medical diagnosis/or surgical procedure
- One per nursing diagnosis with discharge status
- One per nursing interventions with type of action
- One per agency (646 HHAs: Appendix 6.2)

There were seven separate computer datasets representing the raw data (Appendix 6.3). All datasets were fixed length, fixed format ASCII records. Corresponding SAS datasets were also available. Several additional derived summary datasets were required for analysis such as datasets which count the total number of visits by a particular provider type during a period of time (such as first 30 days or total case), and datasets which recoded the nursing diagnoses and interventions into home health care components. Additional datasets included the special dummy variables for building predictive models, as well as merged datasets for combining data from all of the raw datasets. Seven computer datasets were developed and are described below:

Abstract Form Dataset

The Abstract Form dataset (8,960 records) was the main dataset with fixed field records. It contained all of the pre-coded responses on the Abstract Form. There was one record per case and it included up to six medical diagnoses and/or surgical procedures. The dates of admission and discharge to home care were less reliable than the actual visit dates. The dates of hospital episodes were also not completely reliable.

Nursing Services Dataset

The nursing services dataset (8,960 records) contained the 85 HCFA treatment codes from the HCFA 485 Form as alphanumeric text, one code per record, multiple records per case.

Visit Dates Dataset

The visit dates dataset (182,607 records) contained the actual visit dates for all six types of providers. Since cases may have had more than one visit by the same provider type on the same date, there was a field for number of visits which was normally set to one unless there was more than one visit on the same date. There was an average of twenty records per case.

Nursing Diagnoses Dataset

The nursing diagnoses dataset (40,493 records) contained the complete information coded from narrative nursing diagnoses and patient problems section of the Abstract Form including the discharge status for each nursing diagnosis.

Nursing Interventions Dataset

The nursing interventions dataset (81,185 records) contained the complete information coded from the narrative nursing services (interventions and treatments) section of the abstract. It also included the prefix code for the type of intervention (assess, care, manage, teach) and the three digit intervention code.

Agency Information Form Dataset

The Agency Information Form dataset (646 records) contained data about agency characteristics and staffing from the agency data form. It contained similar data items to the HCFA MMACS computer tape.

Patient Records of Cases Dataset

The patient records of cases dataset (8,960 records) contained the linkage information necessary to link a case to the agency data and to the Medicare claims. They also included the zip code and the date the abstract was prepared. They were kept separately to preserve confidentiality of medical data, but the agency number was usually merged with the abstract record.

7. STATISTICAL METHODS

The statistical methods for this research project had two major goals: (a) the description of the universe of home health care, and (b) the development of a method for classifying home health care to predict resource requirements. The first goal focused on presenting the descriptive findings from the national sample of HHAs and the sample of patient records which are referred to as cases. The second goal focused on developing statistical models to predict resource requirements.

This section provides a description of the statistical methods used to analyze both the research descriptive variables and the predictive findings.

Descriptive Analyses

The descriptive analysis focused primarily on frequency distributions and means. For a few subgroups differences in frequencies or means were analyzed by chi square or t-test. Also, the descriptive findings, where possible, were compared to those of a few other studies with similar data.

Excluded Cases

The only cases excluded from the descriptive analysis were the few outliers and several non-Medicare cases which did not fit the criteria for inclusion in the study, and the non-nursing cases in which only physical therapy was provided.

National Sample Agencies and Cases

The national sample agencies participating in the project were compared to the universe of all HCFA certified home health agencies in terms of agency size, type of ownership, and geographic location. Also, the sample patient records of cases were compared to the national sample of HHAs in terms of agency size, type, ownership, and geographic location. However, the number of cases per agency were too few to use as a unit of analysis.

Summary Measures

The large number of variables for each case required the use of summary measures to simplify the analysis. The visit dates were summarized using measures of dispersion. Methods were developed to cluster and aggregate other data elements, such as summary ADL scales, summaries of patient problems/nursing diagnoses, patient services/nursing interventions, and medical diagnoses or surgical procedures.

Measures of Case Intensity

Measures of case intensity were considered critical to refine aggregations of visits during an episode of care. The frequency and pattern of visits as well as the provider mix of services were measured in a fashion which was independent of although correlated with the length of the episode of care.

Patterns of Home Health Services

Basic descriptive analyses including multivariate analyses of variance provided insight into variation in patient characteristics such as socio-demographic variables and functional status, as well as patient assessment, services, and outcomes. Because of the large number of statistical tests used, significant differences due to chance alone were likely, thus, conservative approaches were employed in analyzing the data.

Patient Assessment Relationships

The relationships between the various patient assessment variables: (a) medical diagnoses or surgical problems, (b) nursing diagnoses, (c) nursing interventions, and (d) provider mix of services were explored to identify clusters and classes of patients.

Predictive Analyses

Linear regression and analysis of variance (ANOVA) were the most useful statistical tests for predicting resource requirements. Stepwise regression and logistic regression tests were also explored, but found to be less useful and less appropriate for the data. Predictions of resource requirements were made using two types of statistical models: (a) regression models and (b) categorical models.

Regression models are linear regression equations which compute the predicted value of a dependent variable using one or more (multiple) independent or predictor variables. Categorical models are regression equations that assign each case to a single category such as primary medical diagnosis or surgical procedure based on a categorical variable.

This section first describes the statistical methods used to compute and evaluate the predictor variables; secondly, it describes the different variables used in the various regression and categorical models. The findings obtained with the most statistically significant regression and categorical models will be presented in Chapter 9.

Excluded Cases

As has been explained, for purposes of studying resource utilization, the study was limited to Medicare nursing cases of less than one year duration. Consequently, the atypical chronic cases (several years in duration) and the non-nursing cases requiring only physical therapy were excluded.

Linear Regression

Linear regression computes a regression coefficient for each independent variable in the predictor models which is essentially a measure of the weight of the variable. Linear regression was used for all predictor models based on demographics, nursing diagnoses, and nursing interventions because a single case is a member of more than one group. A simple additive model was used which ignored interactions among groups. Linear regression models were also used for combinations of nursing diagnoses, nursing interventions and demographics. The regression models used dummy variables which were assigned the value of 1 or 0 to indicate the presence or absence of a demographic variable, nursing diagnosis, or nursing intervention in a particular case.

The predicted number of visits for any case is computed by adding the regression coefficients, for example, nursing diagnoses to the intercept value. The intercept is an artificial term which is the number of visits for a case without any nursing diagnoses. It is used to compute and minimize the variance in the regression.

The individual regression coefficients in this type of model are interpreted as the average number of additional visits to manage a case with a particular nursing diagnosis compared to cases without that nursing diagnosis. Negative regression coefficients are seen for nursing diagnoses which require fewer visits than cases which lack those nursing diagnoses.

The tables of regression coefficients (Chapter 9) include the overall mean number of visits so that the magnitude of the regression coefficient (i.e., additional visits required) can be compared to the mean number of visits for all cases. The overall R-square of each model is also included and used to evaluate the ability of the model to predict resource requirements.

Analysis of Variance (ANOVA)

Analysis of variance (ANOVA) was used for variables (such as ADL scales) where cases are classified into a single mutually exclusive group. ANOVA by the General Linear Model (GLM) method was used in place of a simple ANOVA procedure because it provides a more valid statistical treatment for groups of varying size and variance. ANOVA computes group means within each classification category, such as level of ADL score or primary medical diagnosis, and then tests for difference between the group means. The predictive value of the dependent variable is the mean value for that categorical model.

ANOVA also provides a comparison of difference between the within group and between group variance that is a measure of the effectiveness of the predictor model. This method was used to develop categorical models for functional status (ADL), medical diagnosis, combinations of nursing intervention types, and combinations of nursing diagnosis discharge status (treatment goals).

Stepwise Regression

Stepwise regression was explored as an alternative to linear regression because it helps to focus on the key independent or predictor variables which have the largest influence on the dependent variable. Stepwise regression selects independent variables for inclusion in the model based on their contribution to explaining the variance in the dependent variable and continues to add (or remove) variables from the model as long as there is a statistically significant change in the regression results. The final regression model contains only a subset of the independent variables.

Stepwise regression was tested using our regression models and found to be less useful clinically than simple linear regression because the resulting models dropped many clinically interesting variables and the regression parameters were different from those found with linear regression and harder to interpret. The tables of regression results (Chapter 9) presented include only the results of linear regressions which include all components of each regression model and excludes the stepwise regressions.

Logistic Regression

Logistic regression is a specialized form of regression analysis in which the dependent variable has only two possible values such as true or false. Logistic regression was used for the prediction of membership in Cohort 1 (cases under 30 days). This approach yielded statistically significant results but they were not clinically useful

since the data were based on a discharge abstract summary for the entire episode of care and not on an admission assessment. The amount of variance explained and the accuracy of the predictions were relatively small and therefore the detailed results of this analysis were not presented.

Evaluating the Performance of Prediction Models

The overall R-square proved to be the best tool for comparing the performance of different regression or categorical models in predicting resource use. A complete description of the evaluation of these models follows.

Statistical Significance of a Model

The overall statistical significance (p value) of a regression model or categorical model compares the model's ability to predict the value of the dependent variable with that expected from chance alone. Statistical significance is easy to achieve with large samples; therefore it should not be the only step in assessing the performance of a regression model. All of the models presented below were statistically significant which means that the predictor variables exceeded chance alone in predicting the value for the dependent variable.

Variance Explained by Model R-square

The R-square of a model indicates the percent of variance explained by the regression equation or model. R-square provides a good measure for determining which models explain more of the variability of the dependent variables. The R-square is based on partitioning the variance around the mean of the dependent variable into a portion that can be explained by the categorical model (and quantified in the regression coefficients of the regression model or the group means of a categorical model) and a residual or error term which represents case to case variation (due to chance and other factors) which is not explained by the model.

Magnitude of the Regression Coefficients

The value of the individual regression coefficients (which can be positive or negative) is a measure of how strongly a single independent variable (such as a demographic variable or a nursing intervention) influences the total resource utilization. Review of a list of predictor variables sorted by regression coefficients provides insight into the independent variables which influence resource requirements. For example, the mix of home health providers should impact on the predictor variables and numbers of visits.

Statistical Significance of the Regression Coefficients

Sorted lists of regression coefficients were used by first testing each coefficient for statistical significance against a null hypothesis that the value of the coefficient is not significantly different from zero. Even if the overall regression is significant, many of the individual coefficients may be too small to be distinguished from zero at an appropriate level of statistical significance such as $p \leq .05$.

Regression coefficients not statistically significant in their own right were not analyzed to draw conclusions independent of the overall model in which they appear. It was important to distinguish between the p value of a single regression coefficient and the p value for the regression equation or model as a whole. The whole model can be a good predictor of resource use even if several of the variables used to construct the model make such small contributions to the regression model that they cannot be statistically considered as greater than zero.

Partial Correlations in the Stepwise Models

The sequence of addition of variables to a stepwise model is controlled by the amount of variance explained rather than by the simple magnitude of impact on the regression coefficient. Only significant coefficients are included in the stepwise models. As explained above, the results of stepwise regression were hard to interpret; the linear regression models which include all of the nursing diagnoses or nursing interventions were found to be preferable.

Development of Regression and Categorical models

Development of the regression and categorical models was designed to construct a home health classification method for predicting resource requirements. Other health care classification methods generally divide the population into a limited number of mutually exclusive groups such as the 470 DRGs used in acute care hospitals. As stated as a critical issue, home health care does not lend itself to any simple unidimensional classification method because there is no valid and widely accepted method for designating a single primary nursing diagnosis or nursing intervention to a case.

The regression and categorical models frequently combined several different dimensions of the case. Each took into account the range, variety, and number of different nursing diagnoses or nursing interventions seen in a single case. The concept of the components of home health care was developed during this study to allow for analysis of complex home health nursing cases with a manageable number of variables that can be included in valid and useful regression models.

Simpler categorical models based on activity of daily living (ADL) scales or primary medical diagnosis were also evaluated for comparison with the regression models. Some of the most effective predictions were achieved by combining more than one regression model into a large composite regression model based on more than one dimension such as demographics and nursing diagnosis HHC components.

Measures of Resource Use (Dependent Variables)

A key problem in developing categorical models is to define appropriate measures of resource use for home health nursing. Acute care hospitals have used the length of stay or the total cost as measures of resource use for purposes of developing diagnosis related groups (DRGs) for predicting resource use. Comparable summary measures such as length of stay (LOS) or total cost were not available from the patient record for home health care where each case consists of separate visits by a varying mix of provider types spread over a variable period of time.

The length of the case between the first and last visit is not by itself an appropriate measure of resource use because it does not reflect the intensity of care provided; some cases may have as few as one visit per week while others require two or three visits per day. The length of case described later is presented in cohort model as being separated into three classes: (a) short term (under 30 days), (b) intermediate (30 to 120 days), and (c) long term (over 120 days).

Since the focus of this study was on home health nursing care, it was limited to two key dependent variables – number of visits and length of episode. Home visit data were collected separately for all providers. However, based on the frequency distributions only two measures were considered significant – nursing visits and all provider visits which were weighted to reflect the home health aide visit as two-thirds of a visit. The length of each case was also analyzed according to various time intervals. This resulted in the selection of two significant time periods -- first 30 days and total episode. This approach made it possible to test a very large number of regression and categorical models.

Nursing Visits for First Thirty Days

The number of nursing visits within the first thirty days of each episode of care (NVRN30) for each case (start of case defined as the date of the first visit) was used as a dependent variable because preliminary descriptive analysis revealed that the intervention level of the case was most intense during that period. Focusing on the first

thirty days of the case (regardless of the total length of the case which exceeded thirty days in about half of the cases) proved to be a good strategy in reducing variability between cases due to varying length of the case and provided a better dependent variable for testing the ability to predict resource use with the regression models.

Weighted Total Visits for First Thirty Days

The weighted total visits for all providers (treating home health aide visits as 2/3 of a nursing visit) during the first thirty days (NVWT30) was used as a more refined measure of the predictive capability of the independent variables – demographics, nursing diagnoses, and nursing interventions, than the total case weighted visits (NVWTALL) (dependent variable), which varied over a wider range due to other factors which might have affected the total length of the case.

Nursing Visits for Total Episode

The total number of nursing visits during the entire case (NVRNALL) (cases over one year in duration were excluded from this portion of the analysis) was the main dependent variable explored initially and hypothesized to correlate best with the nursing diagnoses and nursing interventions.

Weighted Total Visits for Total Episode

The weighted total number of visits (NVWTALL) included visits by all six provider types: (a) skilled nursing, (b) home health aide, (c) physical therapist, (d) occupational therapist, (e) speech therapist, and (f) medical social worker. The total number of visits was calculated for the entire episode of care and was used as a dependent variable. This variable was the best measure of total resources used and the total cost of the entire episode of care.

Length of Episode/Cohorts

The length of the episodes of care for all cases was classified into three cohorts: (a) under 30 days), (b) 30 to 120 days, and (c) over 120 days. These were considered to be indicators of the type of home health nursing care required: short term, intermediate, or long term. Membership in one of the cohorts helped determine which regression or categorical model to use and it was also used to classify the cases for descriptive purposes to test for differences in the frequencies of nursing diagnoses and nursing interventions. Cohort membership was also used as a dependent variable for regressions in which cohort membership was predicted.

Dependent Variables Not Used in this Analysis

Some dependent variables were developed but were not used in the analysis because they were not considered important. Lack of resources also limited the analysis of additional variables. Because the project focused on home health care, for which nursing is the primary provider, the nursing diagnosis and nursing intervention variables were analyzed as predictor variables but also the number of nursing visits were analyzed as measures of resource use.

Visits by Home Health Aides

The number of visits by home health aides in the first 30 days and for the total case might be an interesting dependent variable to explore. These visits might relate differently to specific nursing diagnoses or nursing interventions than nursing visits. The mix of skilled nursing and home health aide visits may also be more influenced by agency factors than patient factors. The analysis of visits by home health aides should be pursued in future studies where agencies could provide a larger number of cases per agency.

Visits by Other Professionals

Visits by professionals other than skilled nursing and home health aide included physical therapy, occupational therapy, speech therapy, and medical social work. Because these services were not uniformly available from all agencies, it was decided to include them in the aggregated weighted visits rather than analyze them separately.

Unweighted Visits by All Providers

The unweighted total number of visits was not a good proxy measure for cost and not well correlated with the predictor variables as was the weighted visits measure.

Actual Total Cost of Episode

Data on actual total cost of the episode of home health care for each case were not available and not included in the analysis. Costs of visits vary by size of agency, type of agency ownership, and geographic location. While access to HCFA claims data can provide information on costs, data may well be a less valid and precise measure of resource use than visit data.

Predictors of Resource Requirements (Independent Variables)

A major problem in developing categorical models was to define appropriate predictors of resource requirements for home health care. Acute care hospitals use the diagnosis related groups (DRGs) for classifying inpatient admissions and predicting resource use. DRGs are not applicable for home health. Further, studies have shown that the medical diagnoses, upon which the DRGs are based, have little or no relationship to resource requirements for home health services.

Seven types of independent variables were considered to be the most significant predictors of resource requirements. These were determined from the descriptive analysis of the data elements. Each type of variable represents a different aspect of the case considered to have an impact on the resources needed for an episode of home health care. They include: (a) demographics, (b) functional status, (c) nursing diagnoses, (d) nursing diagnoses discharge statuses, (e) nursing interventions, (f) types of nursing interventions, and (g) medical diagnosis.

These variables were evaluated according to their impact on actual resource use. They were analyzed and evaluated using the regression and categorical models. These variables are described in this section and findings are presented in Chapter 9.

Demographic Regression Models

Demographic variables are often considered to be significant predictors of resource requirements. Generally, individual variables were not found to be significantly related to resources used; however, when used in combination, they were significantly related. Ten demographic variables were used to build the regression models. Each of these demographic variables were regrouped and recoded as binary dummy variables represented by 0 = no and 1 = yes. They included: (a) age, (b) male (sex), (c) white (race), (d) married (marital status), (e) lives alone (living arrangement), (f) cares for self (available caregiver), (g) owns house (housing), (h) comprehension level, (i) communication level, and (j) pets in home.

Functional Status Categorical Models

Functional status is considered a good predictor of resource requirements. Functional status was measured and analyzed using five different scales of the activities of daily living (ADL). Two of the five scales previously described were selected for the

predictive models: (a) RUGS ADL with four data elements, and (b) Georgetown Scale (GU ADL) with nine data elements. Each of these two scales were tested using the categorical model which measures a single variable for each case as a predictor of resource requirements.

Functional Status: RUGS ADL

RUGS ADL has a possible score that ranges from 3 to 10. It consists of a four item scale that measures: (a) toileting, (b) eating, (c) tube or parental feeding, and (d) transfer.

Functional Status: GU ADL

The Georgetown functional status (GU ADL) scale has a possible score that ranges from 9 to 27. It consists of nine items: six Katz ADLs plus walking and two IADLs. They are: (a) bathing, (b) dressing, (c) toileting, (d) transfer, (e) continence, (f) feeding, (g) walking, (h) using the telephone, and (i) managing medications. This scale provided a better predictor of resources requirements than the others.

Nursing Diagnoses Regression Models

The number of nursing diagnoses (regardless of specific nursing diagnosis or groups of nursing diagnoses) were explored in a regression model. The model assumed that the number of different nursing diagnoses reflects the complexity of the case and the intensity of home health care.

These regression models based on the original two lists of nursing diagnoses: (a) list of one hundred forty-seven (147) (two and three digit) and (b) list of forty-two (two digit) nursing diagnoses were not useful because the other regression models indicated that all models using nursing diagnoses are not equivalent for the resource requirements they predict. Further, the level of detail of the two and three digit coding schemes varied and may not have been applied uniformly by all agencies.

Twenty Nursing Diagnoses HHC Components

Twenty (20) nursing diagnosis (RN Dx) home health care (HHC) components were developed by regrouping and recoding the one hundred forty-seven (147) nursing diagnoses. Based on the actual frequencies, they did produce a useful regression model. They were better predictors of resource requirements than the number of specific nursing diagnoses and a more realistic measure than the list of one hundred forty-seven (147) nursing diagnoses or forty-two (42) major nursing diagnosis categories, nine human response patterns or eleven functional health patterns.

Discharge Status/Outcome Measures

It was determined that the discharge status of each nursing diagnosis could serve as proxy measure of the expected outcome or treatment goal for a case. This determination could also be used as an appropriate measure for quality of care assessments. The discharge status of each nursing diagnosis was coded using five categories. They were regrouped and recoded into three discrete outcomes: (a) **Resolved/Improved**, (b) **No Change/Stabilized**, and (c) **Worse/Deteriorated**.

These were merged with the list of 20 Nursing Diagnosis HHC Components and the combined scale was used in the regression models.

Discharge Status Patterns

Patterns of the three discharge/outcome statuses (regardless of the number of times they were used) were also used to build a categorical model which would separate cases which were focused exclusively on curable nursing diagnoses from those in which no change or deterioration was expected. These were then analyzed using actual combinations.

Nursing Interventions Regression Models

The number of nursing interventions (regardless of which specific interventions or types of interventions) was also explored in a regression model. Based on the assumption that the number of different nursing interventions reflected the complexity of the case and the intensity of home health care.

The regression model based on the lists of the fifty-six (56) two digit, one hundred sixty-six (166) two and three digit, or the list of the four digit nursing intervention data was not useful because the other regression models indicated that all models using nursing interventions are not equivalent in the resource use they predict. Further, the level of detail in the three and four digit coding schemes was diverse and may not have been applied uniformly by all agencies.

Twenty-two Nursing Intervention HHC Components

The twenty-two (22) nursing interventions (RN Rx) HHC components were developed by regrouping and recoding the one hundred sixty-six (166) nursing interventions. Based on the actual frequencies, they produced a useful regression model. The number of different nursing intervention components involved in a case was a much better predictor of resource use than the number of specific nursing interventions. These twenty-two (22) nursing intervention components were based on actual frequencies and

correlated with the twenty (20) nursing diagnosis HHC components. These components provided a more realistic measure than the original list of one hundred sixty-six (166) nursing interventions or list of fifty-six (56) major nursing intervention categories.

Types of Nursing Interventions

A scheme of four discrete types of nursing intervention was also used. The scheme consisted of: (a) Assess, (b) Care (c) Manage, or (d) Teach. Regression models were constructed by counting the number of interventions for each type of action. The four regression coefficients which are computed reflect the relative contribution of each of these types of nursing interventions. They were analyzed with the 22 nursing intervention HHC components making 88 possible combinations.

Unlike most of the other regression models using dummy variables which can only have the value of zero or one, these models used the actual number of nursing interventions for each type.

Patterns of Types of Nursing Interventions

The patterns of combinations of different types of interventions (regardless of the number of times each type was used in a single case) were used to build a categorical model which compared cases which were Teach only to cases which involved a different pattern of care such as Assess and Manage. Some of the smaller frequency groups were combined by adding the type Assess to other combinations of types such as Care and Manage which imply that assessment was also done. These four types of nursing interventions were analyzed using actual combinations.

Medical Diagnosis Classification Models

Twenty Medical Diagnosis Groups

The primary reason for admission for an episode of home health care is a medical diagnosis (MD Dx) or surgical procedure groups. These conditions were selected from the ICD-9 CM using both body systems of disease conditions and surgical procedures. Because only one variable was used for each case, they were based on actual frequencies of the primary medical or surgical procedure. As a result twenty (20) groups were used as predictors of resource requirements.

Composite Regression Models

Several composite regression models were formed by combining all predictor variables from two or more regression models into a single large model. The advantage of these combined models is that more independent variables should work together to explain more of the variance and the simultaneous use of two sets of predictor variables provides another comparison of their relative roles in determining resource requirements in the overall case. The size of the regression coefficients, or the order of their inclusion in a stepwise regression model, can be used to compare the relative importance of nursing diagnosis and nursing intervention, or demographic factors vs. nursing factors.

The following is a list of the composite models which were tested:

- Nursing Diagnoses and Nursing Interventions (RN Dx, RN Rx) Regression Models
- Nursing Diagnoses and Demographics (RN Dx, Demo) Regression Models
- Nursing Interventions and Demographics (RN Rx, Demo) Regression Models
- Nursing Diagnoses, Nursing Interventions, and Demographics (RN Dx, RN RX, Demo) Regression Models

Analytical Methods for Cohorts

Review of the descriptive data for visits, nursing diagnoses, and nursing interventions led to the hypothesis that home health care nursing cases could be separated into three types: (a) short term cases of less than thirty days which will focus on solutions of immediate problems through care, teaching, or referral; (b) intermediate cases of 30-120 days duration which will focus on continued care; and (c) long term cases of over 120 days which will focus on chronic cases which do not improve in status or get resolved.

Separation of the cases into these three cohorts was studied collectively and separately and therefore was anticipated would require separate predictive analyses for each cohort because their resource requirements are different. The regression models and categorical models were designed to predict resources based on the differences in patient characteristics (demographics, nursing diagnoses, nursing interventions, and medical diagnosis) noted in the descriptive analysis.

The analysis of the cohorts focused on three tasks: (a) describing the characteristics of each cohort, (b) predicting which cohort a case would belong to, and (c) describing variations in the home visits for each cohort for different periods of time such as first thirty days or total episode of home health care.

Because this was a retrospective study, the cases would be classified based on the length of the episode and placed into cohorts. However, prospective approaches will be needed to predict and validate these findings.

8. DESCRIPTIVE FINDINGS

Overview

The GUHHC research project provided one of the most complete descriptions of the home health care industry ever obtained. It provided not only information on a national sample of Medicare certified home health agencies, but also detailed information on the abstracted patient records, called cases, served by these agencies. Many of the findings validate previous knowledge about the home health industry and its Medicare patients. In addition, this research project collected new information which provides a better understanding of this expanding and important health care field.

This section provides an overview of the descriptive findings from analysis of the research data. It contains a brief description of the national sample of 646 home health agencies (HHAs) each of whom abstracted approximately 5 to 50 patient records. Also presented in this section is an in-depth analysis of the 8,961 patient records of cases that were collected for episodes of home health care that occurred primarily in 1988. These sample records were analyzed, not only in comparison to the national sample of HHAs, but also according to the variables that were considered relevant to the development of the home health classification method.

Home Health Agencies

The national sample of 646 home health agencies (HHAs) that participated in the research project consisted of those who agreed to participate from a sample frame of 1,580 HHAs. They were randomly selected from the 1986 HCFA Medicare and Medicaid Automated Certification System (MMACS) list of 5,880 certified HHAs.

These 646 HHAs represented 40.9 percent participation of those solicited (1,580) and 10.8 percent of the universe (5,880) of certified HHAs. The national sample HHAs, when analyzed using the sample frame criteria, clearly demonstrated that the GUHHC project national sample was representative of the universe of certified HHAs. The criteria were: (a) agency staff size, (b) type of agency ownership, and (c) geographic location.

Agency Staff Size

The staff size of the HHAs was analyzed according to the number of full time equivalent (FTEs) registered (skilled) nurses employed. Agencies were grouped according to four strata: (a) 1 to less than 5 FTE RNs, (b) 5 to less than 14 FTE RNs, (c) 15 to less than 65 FTE RNs, and (d) 65 and over FTE RNs which also included the 28 HHAs with staff size of 100 FTE RNs and over.

The staff sizes of the national sample were compared to the universe of Medicare certified home health agencies (HHAs). As shown in Table 8.1, the largest number of HHAs that participated in the study were medium sized agencies (5 to < 14 FTE RNs), or 37.5 percent. However, the smallest staff size HHAs (1 to < 5 FTE RNs), representing the largest group (60.9%) of HHAs in the universe, participated more than expected, 9.5 percent. This involvement was significant, since this group has the least amount of resources to participate in a study of this kind. On the other hand, the large HHAs, undoubtedly have adequate resources for participation in the project actually had the least participation, almost 3 percent.

Type of Agency ownership

The type of HHA ownership was also used as one criterion in the selection of the national sample. They were grouped according to four types of ownership strata : (a) voluntary, (b) hospital-based, (c) official, and (d) private non-profit home health agencies. As shown in Table 8.2, these four types of ownership groups were well represented in the sample. The largest number of HHAs in the national sample were the private, non-profit and proprietary HHAs, with 31.3 percent. This group also represented the largest group in the universe of certified HHAs and highlights the trend in the industry from voluntary towards private ownership.

The official agencies, which include health departments and combination agencies participated the least, 17.3 percent. Though they are HCFA certified, these agencies generally provide only home health services to indigent patients.

Geographic location – Four Regions

Geographic location was also used as a criterion in the selection of the national sample. Geographic locations were grouped into four regions of the United States: (a) North, (b) South, (c) Midwest, and (d) West. As shown in Table 8.3, the four geographic locations were well represented. The largest number of participating HHAs were from the North and Midwest with 29.7 percent each. When compared to the universe of HCFA certified HHAs they were similar in representation.

Geographic Location – States and Regions

The national sample had representation from every state in the United States. As shown in Table 8.4, all 50 states, Puerto Rico, and the District of Columbia participated in the research project. New York, Pennsylvania and California were the three largest states to participate representing over 20 percent of the HHAs.

The national sample agencies were also compared to those in the universe of certified HHAs by the ten geographic regions. As shown in Table 8.5, the national sample represented 10.8 percent of the universe, and included all ten DHHS regions. The largest representation was from Region V with 22.4 percent and the lowest was from Region X with 2.7 percent. The Northwest, Midwest, and Southwest Regions provided less than 5 percent of the sample. These are areas which are sparsely populated and where state and local official health departments provide the majority of the home health services.

Patient Records of Sample Cases

A total of 8,967 sample cases were collected from the 646 HHAs representing a national sample of home health care patients. These were patient records of recently discharged cases that were abstracted for an entire episode of home health care to form the research project sample population called cases. This sample of cases characterizes the Medicare population receiving home health care services. It is one of the largest compilations of home health patient data ever assembled together for analysis.

These sample cases were analyzed to provide a profile of the home health cases according to the HHAs that provided the care. They were analyzed according to the same criteria used to select the national sample, namely: (a) agency staff size, (b) type of agency ownership and (c) geographic location. They were not analyzed by individualized HHAs because the average number of cases collected per agency, fourteen, was too small to be statistically significant.

The actual number of cases analyzed in this section was based on a sample size of 8,840. The original sample submissions of 8,967 cases was revised downward to exclude 127 cases that did not meet the research criteria. Six cases were outliers with episodes of care over ten years duration, 39 cases were non-Medicare recipients, and 82 cases were considered non-nursing because they did not provide evidence that a nursing visit was made during the episode of care.

Cases by Agency Staff Size

The 8,840 research cases were analyzed according to the criteria used to select the national sample of HHAs. The first criterion, agency staff size was similar to the national sample of agencies. As shown in Table 8.6, the medium sized HHAs (5 to < 14 FTE RNs and 15 to < 65 FTE RNs) together provided the largest number of cases, 6,600 or 74.7 percent. The largest HHAs staff size (65 and over FTE RNs) provided the fewest cases, 448 or 5.1 percent.

Cases by Type of Agency Ownership

When the 8,840 sample cases were analyzed, by types of agency ownership, the distributions were similar to the national sample (Table 8.7). The largest number of cases were collected from the private, proprietary agencies, 2,956 or 33.4 percent. The voluntary agencies, including the visiting nurse associations and hospital-based agencies, collected fewer. This is probably due to lack of resources. The smallest number of cases were collected by official agencies, 1,279 or 14.5 percent. As previously stated they generally provide home health care services to indigent patients.

Cases by Agency Geographic Location – Four Regions

The sample cases were also analyzed by the third criterion used to select the national sample – four geographic regions. As shown in Table 8.8, the number of cases in four regions was almost identical to the national sample. This finding reinforced that fact the research sample cases provided a representative sample of universe of home health care patients.

Geographic Location – 50 States and 10 DHHS Regions

The sample cases were also analyzed by state and region. As shown in Table 8.9, all states and regions were well represented. In keeping with other project statistics, the largest number of cases were collected by agencies in three states – New York, Pennsylvania and California – representing 22.6 percent of the cases. However, Region V provided the largest number of cases with almost 2,000 cases, approximately 23 percent.

Sample Cases Characteristics

The characteristics of the 8,840 research sample cases are highlighted below. Frequency distributions of all significant variables considered critical to the research and the development of the classification method are presented. Also, where appropriate, the findings are related to those described in the literature.

The socio-demographic data are described first, followed by admission and discharge data, functional status (ADL), nursing assessment of patient problems/nursing diagnoses, patient services including skilled nursing interventions, medical diagnoses or surgical procedures, and lastly visit data including the length of the episodes of home health care.

Typical Sample Patient

The majority of the sample patients in the study were white, married or widowed females, and over 70 years of age. Typically, they lived in their residences with their spouses, other family members, or friends who were considered to be available caregivers. These patients were able to comprehend and communicate and able to follow the instructions of their primary nurses, physicians and other care providers.

The majority of these patients were referred for home health care as new admissions from acute care hospitals. They were described by their primary nurse providers as motivated to get better as well as having met their care goals. These patients generally recovered or were stabilized sufficiently to be discharged to self or family when services were no longer needed.

Socio-demographics

The socio-demographic variables were collected to identify those characteristics critical to the research. Relevant and valid variables are highlighted. Their findings were used to select and categorize the variables for further analysis and for the development of the assessment instrument and classification method.

Age and Marital Status

Ages ranged from 24 to 104 years with 14 cases 100 years of age or older. Table 8.10 presents the breakdown by five year intervals of the 8,410 cases that reported their birth date. The four groups between 70 and over 85 years of age included almost 60 percent of the sample cases, with the largest group of cases between 75 and 79 years of age (21.9%).

This finding is consistent with HCFA data which showed that this age group, 75-79 years of age, received the largest number of home visits by HHAs in 1986 (Ruther and Helbing, 1988). These data are also consistent with national trends. As the number and proportion of the elderly increases, there is an increasing demand for home health services. Future projections indicate that there will be a significant increase in individuals 65 years of age and over, and in particular those 85 years of age and over, thus increasing the demand for home care services. (Rabin, 1985).

Of the 8,211 research cases that reported marital status, 89.6 percent were married (44.3%) or widowed (45.3), and 10.4 percent were either never married, separated or divorced (Table 8.11). This item by itself was not significant, because the changes in marital status that occur as an individual ages reduces the reliability of the data. When combined with the item, **living arrangement**, cases not living alone or having an available caregiver, regardless of marital status, were most likely to be recipients of home health services.

Sex and Race

The predominate characteristics of the sample cases were white females. As shown in Table 8.12, 61.7 percent were female and 85.6 percent were white. The remaining 14.4 percent non-white cases shown in Table 8.13 were predominantly black (11.2%) and Hispanic (2.6%). These findings are consistent with HCFA reports on Medicare enrollees and findings from other studies.

In one report on Medicare enrollees' home visits, 64.9 percent were female and 86.2 percent white. In another report 55.7 percent were female (Ruther and Helbing, 1988). Still another showed that 68.8 percent of those who needed home care were women, of whom 86.8 percent were white (Rabin and Stockton, 1987).

Living Arrangements and Available Caregiver

Living arrangement (Table 8.14) and available caregiver (Table 8.15) are related but were collected separately. In terms of living arrangements, 68.9 percent of the cases lived with a family member, relative or nonrelative, and 31.1 percent lived alone. This finding is similar to the 73.5 percent identified as having available caregivers.

On the other hand 31.1 percent lived alone and 26.5 percent reported self as the available caregiver. These data are consistent with other reports in the literature. According to the National Health Interview Survey (1979) 29.3% of the population lived alone and the remainder lived with a spouse, relative or nonrelative (Rabin and Stockton, 1987). It is estimated that approximately 26.4 million Americans who had their 65th birthday are living in their residences and outside of nursing homes (DHHS, 1987).

Generally, a person who lives alone without an available caregiver and requires post-hospital home health care is more likely to use other community services or be cared for in a long term care facility. Those living with spouses are more likely to use home care services.

Housing and Pets in Residence

The majority (76.4%) of research sample cases lived (Table 8.16) in detached houses, townhouses, or mobile homes; 20.6 percent lived in apartments, and the remaining 3 percent lived in rented or personal care homes. The data suggest that the beneficiaries of home health services represent, for the most part, Middle America.

Data on pets in residence (Table 8.17) were collected because of a popular belief that pets make good companions to the elderly. Data on pets are generally not found in the patient record. The findings were therefore based on questioning the primary nurse provider. A little over 20 percent (899 cases) indicated presence of a pet in the home.

Studies have shown that homebound elderly pet owners care for themselves better than non-pet owners in that they eat more regularly and keep their homes warmer. Other benefits include the opportunity for exchange of affection, distraction from one's own problems, stimulation of emotional and physical security, compensation for sensory loss, and incorporation of rhythm and structure into their daily routine (Harris and Gellin, 1990).

Comprehension Level and Communication Level

Data on comprehension levels and communication levels of the cases were collected, like the other descriptive variables, to determine if they had an impact on home health care. The findings, shown in Table 8.18, indicate that 95.5 percent of the sample cases were able to comprehend, with 22.4 percent indicating only partial comprehension. On the other hand, 97 percent, shown in Table 8.19, were able to communicate, with only 13.9 percent indicating partial communication ability.

Mental Status and Prognosis

Mental status was collected on admission of the patient to home health care. However, this variable was expanded to reflect the case's mental status most of the time during the episode of care. As shown in Table 8.20, the majority of cases, 7,533, were oriented. However, 2,647 sample cases were forgetful and 1,453 depressed.

According to a national survey, cognitive impairment increases with age. It has been reported that 20 percent of the total population 65 years of age and older suffer from mild cognitive disability. However, based on available evidence, loss of cognitive functioning is regarded as a leading cause of institutionalization including skilled nursing facilities (Rabin and Stockton, 1987). This may explain why the sample cases comprehended, communicated well and were oriented.

Prognosis of the patient is generally reported by the referring physician on the admission of a case for home health services. As shown in Table 8.21, the largest group had a fair prognosis, 48 percent, followed by good with 28.5 percent and guarded with 16.1 percent. Only 6.6 percent had a poor prognosis, when in fact over 25 percent deteriorated or died on discharge (Table 8.25). This suggests that the physician's initial assessments are generally conservative and not necessarily predictive.

Admission Status and Referral Source

Data on the admission status (Table 8.22) and referral source (Table 8.23) were collected but not used as independent variables for the classification method. However, these data provided insight into the characteristics of the home health sample cases.

The status of the cases on admission to an episode of home health care was reviewed. The majority of cases (73.4%) were new admissions for the year of the episode of care and or new to the agency. Further, 73.1 percent were direct referrals from acute care hospitals, reflecting implementation of the prospective payment system using DRGs, with cases being discharged from hospitals "quicker and sicker" (GAO/PEMD, 1985; Wood, 1985/86).

Passage of the Omnibus Reconciliation Act (Public Law 94-499) in 1980 eliminated the three-day prior hospitalization requirement. After that time referrals for home care could originate from other sources such as physicians' offices, ambulatory clinics or other out-of-hospital community sources. This change is reflected in the 26.9 percent: 14.2 percent from physician office, 4.1 percent from family or friend, and the remaining 8.6 percent from a variety of other community sources.

Discharge Status, Discharge Disposition, and Reason for Discharge

Three items were used to obtain a better understanding of the cases on discharge from an episode of care in order to identify outcome measures. As shown in Table 8.24, of the 8,713 cases that reported discharge status, 52.5 percent recovered or improved, 22.4 percent showed no change or stabilized, and 25.1 percent deteriorated or died in home or hospital.

The second item addressed discharge dispositions. As shown in Table 8.25, the majority of cases (65.2%) were discharged to self or family. This finding reinforced the third item on reason for discharge which showed that services were no longer needed on discharge for 64.8% of the cases (Table 8.26).

However, as shown in Table 8.25, 34.8 percent of the cases were discharged to other community health agencies. A large number of cases (14.7%) were admitted or readmitted into the hospital, 3.5 percent to a nursing home, and the remaining 16.6 percent to other community agencies or programs, such as hospice agencies for terminal cases or health supervision programs for chronic cases.

These data suggest that for two thirds of the cases, the referral to home health care was appropriate and patient outcomes were favorable. However, for the remaining one third, the majority (14.7%) fell into the group of prematurely hospital discharged, "quicker and sicker", and required hospital readmissions. Whereas for the remainder of the cases, home health care was the interim setting between short term acute hospital care and long term care placement such as skilled nursing facility. These findings contributed to the conceptualization of the cohort model described in the Predictive Findings, Chapter 9.

Goals and Motivation

Two additional items were included in an attempt to measure outcomes based on the interview of the primary nurse provider of the case. The first addressed whether the patient's goals of home health care were met or not, and if not the reason why. The second addressed whether the patient was motivated to get better during the episode of home health care.

The responses provided questionable results since they were based on subjective recall. The findings shown in Table 8.27, indicated that for 56.4 percent of patients met, 30.2 percent partially met and 10.4 did not meet their goals of care. These findings were reinforced by those reported for the motivation question. As shown in Table 8.28, 60.4 percent of the patients were considered to be motivated, 24.7 partially motivated and 7.5 percent not motivated to get better.

Functional Status

Functional status was considered to be a logical predictor of resource requirements for home health care and a critical variable for the classification method. Functional status includes measures that assess the ability to perform basic activities of daily living (ADLs) as well as other activities that measure the ability to perform more complex tasks associated with an independent life style (IADLs).

There was no consensus on what specific functional status variables were predictors of resource requirements in home health care. If the functional status data were not found in the patient record, then they were obtained by questioning the primary skilled nurse provider. Nine functional activities were selected and collected for each case on admission and on discharge for an episode of home health care.

The nine functional status variables consisted of Katz's Index of ADL -- six functional variables: (a) bathing, (b) dressing, (c) toileting, (d) transfer, (e) continence, and (f) feeding. They also included the variable (g) walking or mobility, which was considered by Katz to be critical in home care. And finally, they included two IADLs based on clinical judgement (h) using the telephone and (i) managing medications, which were selected from Lawton's scale of eight so-called instrumental activities of daily living (IADLs) (Katz, 1983).

Analysis of these activities was conducted to indicate progression, regression or stabilization for each case. Three levels of performance were collected with scores for each activity. They included: (a) one point for independent (able to perform), (b) two points for assistance of person/device, and (c) three points for dependent (unable to perform). A combined score of all nine variables provided a range of 9 to 27. This new scale -- Georgetown University activities of daily living scale (GU ADL) -- was considered to be a potentially useful scale for the home health assessment instrument.

Initial analysis focused on the frequency distributions for each of the nine functional variables on admission and discharge by the three levels of performance. According to Katz (1963), the index of independence in ADL is based on independence of an activity without assistance or supervision of a person or device.

Frequencies of Levels of Performance

Frequency distributions were prepared for the three levels of performance on admission and discharge for each of the nine variables. As shown in Table 8.29, the independent and assistance levels of performance for all activities improved from admission to discharge, whereas the dependent levels changed only minimumlly. Independent levels of performance for at least six activities improved significantly, ranging from 10 to 20 percent. These six activities were: (a) bathing, (b) dressing, (c) toileting, (d) transfer, (e) walking, and (f) managing medications. However, three activities: (a) continence, (b) feeding and (c) using telephone improved only marginally. When comparing the dependent levels of performance, the changes were not as significant since several activities changed to the need for assistance performance level.

Functional Status Scales

The nine functional activities were also analyzed using five different combinations and scales based on a review of the literature. They include: (a) Katz ADL Index with six activities, (b) Katz ADL Index for home care with seven activities, (c) RUGs ADL with four activities, (d) IADL with two activities, and (e) GU ADL Scale with the nine variables. The scales are shown in detail in Figure 8.1, and are scored as follows:

- Georgetown GU ADL Scale: nine variables with a score that ranged from 9 to 27.
- Katz ADL Index: six variables with a score that ranged from 0 to 6.
- Katz ADL Index for Home Care: seven variables (included walking) with a score that ranged from 0 to 7.
- RUGS ADL Scale: four variables with a score that ranged from 3 to 10.
- IADL Scale with two variables with a score that ranged from of 0 to 6.

The GU ADL Scale, the Katz Index, and Katz Index for home care, and the IADL Scale have been described. However, RUGs ADL Scale is one that has been described in the literature as having implications for home health care. It consists of three activities, each with three functioning levels, and one additional point for a feeding procedure. They are: (a) toileting with a score of 1 - 3, (b) eating with a score of 1 - 3, and a 4th point for tube or parenteral feeding, and (c) transfer with a score of 1 - 3. The construction of the RUGs ADL Index was formed by adding the scores which range from 3 to 10 .

Frequencies of Functional Status Scales

A comparison of the frequencies and mean scores was made of the five scales shown in Table 8.30. These distributions clearly indicated that the traditional ADL scales were not as relevant as the combined variables used in the GU ADL Scale which has a mean of 14.59. The RUGs ADL had the next highest mean. Based on this comparison, the low means of the Katz ADL Index of six, the Katz ADL for home care of seven, and the IADL Scale of two variables were dropped. However, RUGs ADL and GU ADL Scales were considered relevant and selected for the further analysis as possible predictor variables.

A final comparison was made of the number and percent distributions for the GU ADL Scale. The possible scores for all sample cases ranged from 9 to 27. As shown in Table 8.31, the largest number of cases totaled 763 (9.9%) with an average score of 14. On discharge the scores were completely different, that is the largest number of cases (1,260 representing 17%) had a score of 10, which was almost independent. However, when the scores were compared from admission to discharge, 50.9 percent had no

change and of the remaining 49.1 percent, over 40 percent did not improve and may have deteriorated. These findings have to be viewed as guarded since they were not always recorded in patients' records and were based on the questioning of the primary nurse provider. Further study is needed on the GU ADL Scale.

Nursing Diagnoses

Nursing diagnoses and/or patient problems, as assessed by skilled nursing providers, were viewed in this research as critical measures for predicting resource requirements and therefore essential for the development of the classification method. Status of the nursing diagnoses on discharge when compared to the nursing diagnoses on admission was also considered as expected outcome measures for evaluating home health care.

A nursing diagnosis is a clinical judgement about human responses to health problems for which the nurse is legally accountable and for which the nurse can order definitive interventions (Carpenito, 1989). Generally, nursing diagnoses are made by the primary nurse provider as part of the admission assessment. Reassessments are made during the episode of care and their statuses are evaluated on discharge.

All nursing diagnoses were collected for an entire episode of home health care for each sample case. They were recorded as narrative descriptions and were manually coded using an adapted version of the Nursing Diagnosis Taxonomy I (Fitzpatrick et al., 1989), which consisted of one hundred forty-seven nursing diagnoses, of which forty-two represented major categories (two digit codes) and one hundred five subcategories (three digit codes). The discharge status for each nursing diagnosis was also collected and coded using one of five outcome measures: (a) **Resolved**, (b) **Improved**, (c) **No Change**, (d) **Stabilized/Maintained**, and (e) **Deteriorated/Worse**. The discharge status, when not found in the patient record, was based on the questioning of the primary nurse provider.

A total of 40,361 nursing diagnoses were obtained from the 8,840 patient records of cases. This is the largest volume of nursing diagnoses data ever collected on cases receiving home health care. Since the existing methodologies utilizing nursing diagnosis described in the literature did not focus on home health care, several different statistical strategies were needed and designed to analyze these data.

This section not only describes the strategies used for analyzing the nursing diagnoses data, but also presents their descriptive findings. The findings were in turn evaluated to determine which combinations were the most relevant and could be used as predictors of resource requirements.

Frequencies of Nursing Diagnoses

Frequency distributions were prepared for several different lists of nursing diagnoses using the 40,361 collected from the sample cases. They were designed in order to determine which list was the most relevant to use as predictors of care requirements.

Frequencies for the largest and most detailed list of one hundred forty-seven nursing diagnoses (two and three digit codes) were analyzed first and are shown in Table 8.32. Eleven nursing diagnoses had the largest frequencies ranging from 1,000 to 2,000 nursing diagnoses whereas eleven nursing diagnoses were not used. The three largest number of nursing diagnoses were: (a) **knowledge deficit re medications** with 2,037 (5.1%), (b) **physical mobility, impaired** with 1,973 (4.7%), and (c) **cardiac output, altered** with 1,819 (4.5%).

A second list of the forty-two nursing diagnoses major categories was analyzed next. It collapsed the one hundred-five subcategories (three digit codes) with the forty-two major categories. The three nursing diagnoses, shown in Table 8.33, with the largest frequencies were: (a) **knowledge deficit** with 7,217 (17.9%), (b) **altered tissue perfusion** with 5,825 (14.5%), and (c) **altered activity** with 3,832 (9.5%). Two of these nursing diagnoses -- **knowledge deficit** and **altered activity** -- were the same two most frequent nursing diagnoses on the detailed list. However, **altered tissue perfusion** was a new nursing diagnosis major category which encompassed all the different body systems and disease condition problems.

Because **altered perfusion** had such a large number, it required further analysis to determine the significance of the frequency and nature of the category. Tissue perfusion encompassed nine subcategories representing different body system conditions. Each of these were reviewed and added to the list of forty-two making a new list of fifty-one (51) nursing diagnoses expanded major categories. This revised list was also analyzed to determine in the degree of relevance of these nine additional codes. Table 8.34 presents these frequencies which essentially did not provide any significant new findings.

Counts of Nursing Diagnoses

The actual number of nursing diagnoses for each sample case was also investigated for the list of the one hundred forty-seven nursing diagnoses. As shown in Table 8.35, the counts per case ranged from 1 to 19 per case with the largest number (1,518) having three nursing diagnoses per case representing 17.2 percent of the total sample cases.

On the other hand, counts for the list of forty-two major categories of nursing diagnoses codes shown in Table 8.36 ranged from 1 to 17 per case and with the largest number (1,812) having two nursing diagnoses per case representing only 20.5 percent of the sample cases. Whereas, the counts for the list of fifty-one (51) nursing diagnoses expanded major categories shown in Table 8.37 ranged from 1 to 17 per case with the largest number (1, 716) having three per case and representing 19.4 percent of all the cases. These findings highlight the fact that skilled nurses assess, for each case admitted for home health care, at least three nursing diagnoses or patient problems as requiring nursing care.

Nursing Diagnoses Patterns

Based on the literature and review by nursing diagnoses experts data were analyzed further by aggregating the 40,361 into the nine human response patterns (Fitzpatrick et al., 1989) and eleven functional health patterns (Gordon, 1982). The major problem with these similar strategies was the fact that when a case had multiple codes in the same category they were counted only once. As a result the magnitude of assessed conditions was diminished since in both schemes the category groups were not unique and contained too many diagnoses.

The nine human response patterns were designed to classify the nursing diagnoses labels based on a theoretical framework (NANDA, 1989). The frequencies are shown in Table 8.38. The exchanging pattern had the largest number of nursing diagnoses, with 50.5 percent representing 88.8 percent of all cases. This pattern encompasses almost half of the most common nursing diagnoses making it clinically impractical to use the list of nine human response patterns as a predictor of nursing care requirements. Also shown in Table 8.39 are the counts for the 8,840 cases. They ranged from 1 to 8 nursing diagnoses human response patterns with the largest number (3, 150) having two per case.

The eleven functional health patterns were also designed to categorize nursing diagnostic labels as an indexing system (Gordon 1982). The nursing diagnoses were also aggregated using the eleven functional health patterns. As shown in Tables 8.40 the largest functional health pattern was activity - exercise pattern with 39.4 percent representing 81.4 percent of cases. This functional health pattern encompassed approximately 15 of the most common nursing diagnoses, making the significance of this finding also difficult to evaluate. In further analysis of this grouping the next two frequent patterns were sleep - rest pattern and nutritional - metabolic pattern, neither of which were significantly represented on any of the lists of nursing diagnoses previously used. As shown in Table 8.41, the counts are also presented for the 8,840 cases. They ranged from 1 to 9 with the largest number (2,745) having two per case.

In comparing the two nursing diagnosis schemes the eleven functional health patterns had more relevance than the nine human response patterns. However, neither groups of patterns were considered to be statistically or clinically significant, and therefore it was determined that neither list could be used to predict resource requirements.

Nursing Diagnosis Home Health Care (HHC) Components

A final list was designed using the hypothesis that nursing diagnoses could be used to predict resource requirements for home health care. Based on the actual frequencies, the nursing diagnoses were aggregated into twenty (20) components of home health care which grouped together like nursing diagnoses. The underlying rationale was that nursing diagnoses are used as a basis for planning nursing care including nursing interventions during an episode of home health care. Based on professional knowledge they are assessed by the primary nurse provider as those requiring care and are significant in predicting care requirements.

This final list of twenty (20) nursing diagnosis home health care (HHC) components was derived from the actual 40,361 nursing diagnoses. They focused on home health care requirements and could be mapped to the 22 nursing intervention HHC components. Table 8.42 presents the frequencies of the 20 nursing diagnosis HHC components. The three most frequent nursing diagnosis components were cognitive component with 21.9 percent, representing 52.1 percent of the cases; activity component with 11.5 percent, representing 42.3 percent of the cases; and tissue skin integrity component with 9.1 percent, representing 36.6 percent of the cases. All twenty (20) nursing diagnoses components were well represented on this list.

Two of the three most frequent nursing diagnoses found on the detailed list of one hundred forty-seven were on this regrouped list. The cognitive component encompassed knowledge deficit and the activity component encompassed impaired physical mobility. These comparisons reinforced the selection of this list of twenty (20) nursing diagnosis HHC components as being the most precise of all those analyzed. This new list of nursing diagnosis HHC components was deemed to be clinically significant and was selected to be used as a predictor of home care resource requirements.

The counts of the twenty (20) nursing diagnoses components were also analyzed. As shown in Table 8.43, they ranged form 1 to 14 with the largest number (1,800) having three nursing diagnosis components per case, representing 20.4 percent. These findings were consistent with those of the detailed list of one hundred forty-seven nursing diagnoses.

Nursing Interventions

Patient services provided by skilled nurse providers were also viewed in this research as critical measures for predicting resource requirements and therefore essential for the development of the classification method. They were collected as a measures of actual resource use. The type of nursing intervention can also be considered as a measure for predicting resource requirements.

Patient medical orders (services) are usually initiated by the referring physician on admission to a home health agency for care. The medical orders are generally reviewed by the primary nurse provider during the initial home assessment visit to ascertain their frequency and duration as required by the Medicare regulations. As part of the initial assessment the patient problems, i.e. nursing diagnoses, are also determined along with the plan of nursing care in order to carry out the medical and nursing orders.

The patient services were collected for an entire episode for home health care for all sample cases. This included all services (significant treatments, activities, and interventions) provided on all home visits by all nursing providers that were documented in the patient record. The skilled nursing services were collected on the Abstract Form, not only as the HCFA treatment codes (A1-A27) (Appendix 6.1), but also as narrative descriptions not listed on the HCFA treatment code list, which had to be manually coded. The skilled nursing textual data codes were combined with HCFA skilled nursing treatment codes.

The specially designed nursing intervention coding scheme, which was developed specifically for this research is described in the section on Data Processing. It consists of one hundred sixty-six (166) nursing interventions, fifty-six (56) of which are major categories (two digit codes) and one hundred ten are subcategories (three digit codes). A fourth prefix digit was also used as a suffix to code the four types of nursing actions: (a) Assess, (b) Care, (c) Manage and (d) Teach. This fourth digit expanded the list to 664 possible nursing interventions.

A total of 80,283 nursing interventions were collected from the 8,840 patient records of cases for the research project. This is the largest volume of nursing services data ever collected on cases receiving home health care. Like nursing diagnoses, there were no research methodologies utilizing nursing interventions found in the literature or studies conducted that have analyzed such large a volume of home health nursing data. As a result, several statistical strategies were needed and designed to analyze these data.

This section describes the strategies used for analyzing the nursing interventions data and presents their descriptive findings. The findings were evaluated to determine which combinations were the most relevant as predictors of resource requirements.

Frequencies of Nursing Interventions

Frequency distributions were prepared for several different lists of nursing interventions using the 80,283 collected from the research sample cases. The distributions were designed to determine which list of variables was the most relevant and at the same time useable to predict care requirements.

The largest and the detailed list of one hundred sixty-six (166) nursing interventions was analyzed first. Their frequencies are presented in Table 8.44. As noted the five nursing interventions with the largest frequencies were **medication administration** with 5.7 percent, **cardiopulmonary care** (4.5%), **nutritional care** (4.6%) **restorative care** (3.5%) and **wound care** (3.0%).

Almost all of these nursing interventions were related to the nursing diagnoses most frequently reported. For example, the nursing diagnosis **knowledge deficit re medications** was assessed as requiring the nursing intervention **medication administration**; the nursing diagnosis **physical mobility, impaired** was assessed as requiring **restorative care** or exercises; and the nursing diagnosis **tissue integrity altered** was assessed as requiring the nursing intervention **wound care**. These examples illustrate the nursing process that is used when planning nursing care of home health patients.

A second list of fifty-six (56) nursing intervention major categories (two digit) was analyzed next. It collapsed the one hundred ten subcategories (three digit codes) with the fifty-six (56) major categories. The frequency distributions shown in Table 8.45 identified the same four nursing interventions – **medication administration**, **nutritional care**, **restorative care** and **wound care**. They continued to have the largest frequencies. However the fifth lowest frequent **body system condition care**, was listed which encompasses **cardiopulmonary care** reported on the detailed list.

When the detailed list of one hundred sixty-six (166) nursing interventions was expanded with four types of nursing actions coded as prefixes, six hundred sixty-four (664) possible nursing interventions emerged. The five most frequent nursing interventions were TEACH **medication administration** with the highest frequency of 4.7, percent, followed by ASSESS **cardiopulmonary status** (3.6 %), TEACH **nutritional care** (2.3 %), **provide restorative** CARE, and ASSESS and **provide wound** CARE. These types of actions expanded the scope of the nursing intervention and provided additional information about the levels of care.

Counts of Nursing Interventions

The actual number of nursing interventions for each sample case was also investigated for the lists of one hundred sixty-six (166) and fifty-six (56) nursing interventions. As shown in Table 8.46, the counts per case for the list of one hundred sixty-six (166) nursing interventions ranged from 1 to 42 per case with the largest number (770) having three nursing interventions per case, and the list of fifty-six (56) nursing interventions, shown in Table 8.47, ranged from 1 to 25 per case with the largest number (949) with three nursing interventions per case.

These findings were similar to those obtained for the nursing diagnoses in that regardless of which coding list was used, an average of three nursing interventions per case was found.

Nursing Interventions Home Health Care Components

The analyses of these three different groupings of the nursing intervention scheme did not produce significant findings, probably because the coded lists were too long. It was concluded that they should be grouped into a manageable list that would allow for meaningful analysis. After consultation from several classification experts, the original list of one hundred sixty-six (166) nursing interventions was aggregated based on actual frequencies and mapped to the twenty (20) home health care nursing diagnosis components. The final list of twenty-two (22) nursing intervention home health care (HHC) components was developed.

The twenty-two (22) nursing intervention components are listed in Table 8.48 with their frequencies. Based on the list of one hundred-sixty-six nursing interventions, three of the five largest frequencies were equal. They were -- medication administration, nutritional care, and cardiopulmonary care. The two nursing intervention components -- physical regulation care and health behavior care -- emerged as new interventions that were significant when grouped.

The counts of the twenty-two (22) nursing intervention components were also analyzed. As shown in Table 8.49, they ranged from 1 to 19 with the largest number (1014) having five nursing interventions per case, representing 11.5 percent. These findings were consistent with other analyses.

The major purpose for determining a meaningful list of nursing interventions was to use them as indicators of resource requirements. Nursing services are in fact the major reasons for providing home health care. The list of twenty-two (22) components

proved to be not only manageable and clinically significant, but also an effective measure of resource use and was therefore selected for predicting resource requirements. The list was further analyzed as is described in the Predictive Findings, Chapter 9.

Medical Diagnoses or Surgical Procedures

The primary medical diagnosis and/or surgical procedure were collected for each case for the episode of care. A medical diagnosis or surgical procedure is required for a Medicare patient to be admitted for home health services and for reimbursement by Medicare. The primary condition and four other pertinent diagnoses were collected, however, only the primary reason was analyzed.

Medical diagnoses or surgical procedures data were less complex to analyze because only one entry was used per case whereas nursing diagnoses or nursing interventions required analyzing multiple entries for each case. These variables were recorded on the Abstract Form using the ICD-9-CM codes. The four other pertinent diagnoses were also collected, but were not analyzed due to the sheer volume of data and the numerous combinations that were present.

The medical diagnosis or surgical procedure frequencies were sorted by primary diagnosis or surgical procedure for the episode of home health care. A total of 2,866 surgical procedures, 8,742 medical diagnoses and 8,801 combined medical diagnoses or surgical procedures were analyzed. These were initially tabulated by individual ICD-9-CM codes and then summarized into the 32 major diagnosis groups (17 major headings for medical diagnoses and 15 major headings for surgical procedures). They were finally refined and aggregated by their actual frequencies. As a result twenty (20) groups were developed that encompassed the most frequent surgical procedures and medical diagnoses according to the body systems.

The fifty most frequent medical diagnoses and surgical procedures were sorted by descending order of frequency (Table 8.50) as well as by their ICD-9-CM code numbers (Table 8.51). These lists combined both medical diagnoses and surgical procedures (operations) together. These tables revealed the wide range of medical conditions seen in home health care and the important role of surgical procedures. As shown in Table 8.50, the summary of combined conditions sorted by frequency highlighted the key role of cardiovascular, respiratory, neoplastic, and endocrine conditions as the four leading areas in that order. Musculoskeletal procedures and digestive procedures were most frequent with cardiovascular, respiratory, and urinary conditions. These findings are all consistent with the age distribution of the population.

Table 8.50 also showed the detail for these conditions. Congestive Heart Failure (CHF), Cerebrovascular Accidents (CVA), Chronic Obstructive Pulmonary Disease (COPD), Pneumonia, and Hypertension were the leading medical diagnoses. Decubitus Ulcer, Diabetes, and Myocardial Infarction are also part of the top 10 codes. Ophthalmologic procedures are common and a wide variety of digestive system surgical procedures account for this important component of home health care.

The patterns of medical diagnoses and surgical procedures did not reveal any surprises regarding the content of home health care. The study population included many different medical diagnoses and surgical procedures. The diversity of medical problems and variations in coding did not suggest any simple classification scheme. The limited number of medical diagnoses and surgical procedures which occurred with sufficient frequency represented a reasonable cohort of patients. These conditions such as CHF and CVA are highly variable in their medical severity and presentation, and even more variable in their home health care requirements which relate more to specific patient problems than to the medical management of these conditions.

In general, there were too many different medical conditions to form a useful classification scheme with a limited number of reasonably homogeneous categories, hence the twenty (20) ICD-9-CM major section headings groups were used as the best possible medical classification scheme. The conditions with the highest frequencies were those with variation in severity, medical care requirements, and home health care requirements. The list of twenty (20) groups was selected for the predictive analysis and is described in Chapter 9.

Home Health Visits

Home health visits were viewed in this research as critical indicators of resource use and therefore were essential data for the development of the classification method. They were viewed similarly to days of care using DRGs in acute care hospitals.

The findings when compared to those reported in the literature were different, since most studies did not collect data on the number of visits and the length of the episodes of home health care. A 1985 report by the National Association for Home Care suggested that there were no valid and reliable methods for measuring resource use in the home health industry. As a result the findings in this research represent new information on the largest number of visit data collected on Medicare recipients of home health care.

The home health visit variables were used as measures of resource use and considered to be dependent variables based on the pilot study findings, review of the literature, recommendations from home health nursing experts, and researchers in the field. The visit information consisted of two types of data: (a) number of visits and (b) length of episodes of care.

Number of Home Health Visits

The frequency distributions of the 180,607 home health visits for all 8,691 sample cases were analyzed according to the six home health providers which are reimbursed by Medicare. The mix of home health providers is generally influenced by the referring physician and by the primary nurse provider who assesses the care requirements for a patient on admission to home health care. Visit data collected in this study included home health visits provided by: (a) skilled nurses, (b) physical therapists, (c) occupational therapists, (d) speech therapists, (e) medical social workers, and (f) home health aides.

Provider Visits

A calendar was provided to collect the actual dates of the visits by each of the six types of providers. As previously indicated cases without any nursing visits were excluded from the study. The frequency distributions are presented for each of the six providers by individual provider visits and/or groups of visits as deemed appropriate.

Skilled Nursing Visits

The skilled nursing visits were hypothesized to be the most predictive of the resources used and are descriptive of the services provided. As shown in Table 8.52, 47.6 percent of the 8,691 cases received 1 to 7 visits, representing almost half of all the cases, 28.7 percent received 8 to 14 visits, representing one quarter of all the cases, and the remaining quarter consisted of 18.7 percent which received 15 to 34 visits and 5 percent received 35 to 194 visits.

Home Health Aide Visits

The second largest number of home visits was made by the home health aide. The frequencies presented in Table 8.53 indicate that half of the cases received 1 to 9 visits, and the remaining cases received 10 to 69 visits. Over half (61.3 %) of the cases did not receive any home health aide visits.

Other Professional Providers Visits

The third largest number of visits were made by the physical therapists. As shown in Table 8.54, approximately half of the 1,863 cases received 1 to 6 visits, whereas the remaining half received 7 to 47 visits. Over three fourths (78.5%) of the sample cases did not receive any physical therapy visits. Analysis of the medical social worker visits (Table 8.55) showed that only 12.8 percent of the cases received any visits. The 1,104 cases who received visits had from 1 to 10 home visits. Tables 8.56 and 8.57 show that only 4.3 percent received occupational therapy visits and 2.2 percent speech therapy visits.

Mean Visits

The number visits by each of the providers was also analyzed to determine the average number of visits per provider. As shown in Table 8.58, the highest average mean number of skilled nursing visits was 11.7, as compared to 6.06 for home health aide. Other combinations of provider visits were calculated and their means and standard deviations are shown in Table 8.59.

Based on these findings two dependent variables were selected for further analyses as measures of resource use. They included: (a) the nursing visits with a mean of 11.7, and (b) all provider (weighted) visits with a mean of 18.2. The variable included home health aide visits which were weighted to reflect two-thirds of a visit, since a home health aide visit costs approximately two-thirds that of the other professional providers).

Length of Episodes of Care

It was hypothesized that the episode lengths could be clustered by the type of case or patient condition. Episode lengths were calculated from the number of days from first to the last visit, instead of the number of days from the admission to the discharge date. The visit dates were considered to be more reliable than admission and discharge dates because of the varying methods used by HHAs to open and close a case.

The frequency distributions of visits were analyzed regardless of provider type from the first to the last visit date. Table 8.60 provides a breakdown of the frequency distributions for these 8,691 sample cases. They were grouped by 5, 10, 50, 100 or more day intervals. The most significant finding was that 49.1 percent of the sample nursing cases has episodes less than thirty (30) days. However, when the sixty (60) day intervals were analyzed (Table 8.61), 78.3 percent of the cases were under sixty (60) days, 92.1 percent under one hundred twenty (120) days, and 95.9 under one hundred eighty (180) days. Only one percent had of the cases ranged from approximately one year to two years in length.

Cohorts

A comparison of the visit frequencies by all providers to the length of the episodes of care is shown in Table 8.61. Almost 50 percent of all home visits were under thirty (30) days, and over 75 percent were under sixty (60) days. The remaining 25 percent included home visits that ranged from sixty (60) days to over one year in length. Based on the analysis of the length of the episodes of home health care by days, they were grouped into three distinct cohorts: (a) short term cases (under 30 days), (b) intermediate cases (30 to 120 days, and (c) long term cases (over 120 days) (Table 8.62).

Table 8.1

Comparison of national sample agencies with HCFA Medicare certified HHAs: Staff size

Agency size FTE RNs	National sample Number	National sample Percent	Certified HHAs Number	Certified HHAs Percent
Total	646	100.0	5767[1]	100.0
1 to < 5	126	19.5	3514	60.9
5 to < 14	242	37.5	1646	28.5
14 to < 65	213	33.0	543	9.4
65 and over	18	2.7	64	1.1
Unknown	47	7.2	–	–

Source: HCFA MMACS, 1986.

1/ Excludes 113 HHAs with less than one FTE RN

Table 8.2

Comparison of national sample agencies with HCFA Medicare certified HHAs: Type of ownership

Agency type ownership	National sample Number	National sample Percent	Certified HHAs Number	Certified HHAs Percent
Total	646	100.0	5767[1]	100.0
Voluntary/ VNA	145	22.4	497	8.6
Hospital Based	148	23.0	1502	26.1
Official/ Comb.	112	17.3	1183	20.5
Private/Proprietary	202	31.3	2585	44.8
Unknown	39	6.0	–	–

Source: HCFA MMACS, 1986.

1/ Excludes 113 agencies with less than one FTE RN

Table 8.3

Comparison of national sample agencies with HCFA Medicare certified HHAs: Four regions

Region	National sample Number	National sample Percent	Certified HHAs Number	Certified HHAs Percent
Total	646	100.0	5767[1]	100.0
North	192	29.7	1199	20.8
South	167	25.9	2050	35.5
Midwest	192	29.7	1675	29.0
West	95	14.7	843	14.6

Source: HCFA MMACS, 1986.

1/ Excludes 113 agencies with less than one FTE RN

Table 8.4

Frequency distributions of national sample home health agencies: State

State name	Number	Percent
Total	646	100.0
Alaska	2	0.3
Alabama	24	3.7
Arkansas	5	0.8
Arizona	12	1.9
California	37	5.7
Colorado	6	0.9
Connecticut	10	1.5
Dist. of Col.	2	0.3
Delaware	2	0.3
Florida	30	4.6
Georgia	14	2.2
Hawaii	1	0.2
Idaho	4	0.6
Illinois	26	4.0
Indiana	16	2.5
Iowa	19	2.9
Kansas	7	1.1
Kentucky	12	1.9
Louisiana	4	0.6
Massachusetts	19	2.9
Maryland	8	1.2
Maine	2	0.3
Michigan	26	4.0
Minnesota	18	2.8
Missouri	15	2.3
Mississippi	18	2.8
Montana	4	0.6
North Carolina	16	2.5
North Dakota	3	0.5
Nebraska	6	0.9
New Hampshire	7	1.1
New Jersey	21	3.3
New Mexico	3	0.5
Nevada	4	0.6
New York	51	7.9
Ohio	35	5.4
Oklahoma	2	0.3
Oregon	2	0.3

Table 8.4 (cont.)

Frequency distributions of national sample home health agencies: State

State name	Number	Percent
Pennsylvania	47	7.3
Puerto Rico	3	0.5
Rhode Island	3	0.5
South Carolina	9	1.4
South Dakota	3	0.5
Tennessee	13	2.0
Texas	17	2.6
Utah	4	0.6
Virginia	12	1.9
Vermont	3	0.5
Washington	10	1.5
West Virginia	2	0.3
Wisconsin	24	3.7
Wyoming	3	0.5

Source: HCFA MMACS, 1986.

Table 8.5

Comparison of national sample agencies with HCFA certified HHAs: States and Regions

Region/state	Number	Certified HHAs	Percent
Total	646	5984	10.8
Region I	**44**	**350**	**12.6**
Connecticut	10	113	8.8
Maine	2	16	12.5
Massachusetts	19	148	2.9
New Hampshire	7	40	1.1
Rhode Island	3	13	0.5
Vermont	3	20	0.5
Region II	**75**	**257**	**11.7**
New Jersey	21	62	3.3
New York	51	154	7.9
Puerto Rico	3	40	0.5
Region III	**73**	**633**	**11.3**
Delaware	2	29	0.3
District of Columbia	2	9	0.3
Maryland	8	96	1.2
Pennsylvania	47	292	7.3
Virginia	12	156	1.9
West Virginia	2	51	0.3
Region IV	**136**	**1107**	**21.1**
Alabama	24	124	3.7
Florida	30	177	4.6
Georgia	14	73	2.2
Kentucky	12	96	1.9
Mississippi	18	135	2.8
North Carolina	16	115	2.5
South Carolina	9	44	1.4
Tennessee	13	343	2.0

Table 8.5 (cont.)

Comparison of national sample agencies with HCFA certified HHAs: States and Regions

Region/state	Number	Certified HHAs	Percent
Region V	**145**	**1195**	**22.4**
Illinois	26	273	4.0
Indiana	16	139	2.5
Michigan	26	188	4.0
Minnesota	18	186	2.8
Ohio	35	251	5.4
Wisconsin	24	158	3.7
Region VI	**31**	**1013**	**4.8**
Arkansas	5	155	0.8
Louisiana	4	172	0.6
New Mexico	3	49	0.5
Oklahoma	2	150	0.3
Texas	17	487	2.6
Region VII	**47**	**550**	**7.2**
Iowa	19	163	2.9
Kansas	7	134	1.1
Missouri	15	207	2.3
Nebraska	6	46	0.9
Region VIII	**23**	**254**	**3.6**
Colorado	6	113	0.9
Montana	4	30	0.6
North Dakota	3	31	0.5
South Dakota	3	24	0.5
Utah	4	27	0.6
Wyoming	3	29	0.5
Region IX	**54**	**467**	**8.4**
Arizona	12	72	1.9
California	37	362	5.7
Hawaii	1	14	0.2
Nevada	4	18	0.6

Table 8.5 (cont.)

Comparison of national sample agencies with HCFA certified HHAs: States and Regions

Region/state	Number	Certified HHAs	Percent
Region X	**18**	**158**	**2.7**
Alaska	2	6	0.3
Idaho	4	31	0.6
Oregon	2	66	0.3
Washington	10	55	1.5

Source: HCFA list of Medicare certified agencies, 1986.

Table 8.6

Comparison of the sample cases with the national sample HHAs: Staff size

Agency size FTE RNs	Sample cases Number	Sample cases Percent	National sample Number	National sample Percent
Total	8840	100.0	646	100.0
1 to < 5	1363	15.4	126	19.5
5 to < 14	3298	37.3	242	37.5
14 to < 65	3302	37.4	213	33.0
65 and over	448	5.1	18	2.7
Unknown	429	4.8	47	7.2

Table 8.7

Comparison of the sample cases with the national sample of HHAs: Type of agency ownership

Agency type Ownership	Sample cases Number	Sample cases Percent	National sample Number	National sample Percent
Total	8840	100.0	646	100.0
Voluntary/ VNA	2334	26.4	145	22.4
Hospital-Based	1912	21.6	148	23.0
Official/ Comb.	1279	14.5	112	17.3
Private/Proprietary	2956	33.4	202	31.3
Unknown	359	4.1	39	6.0

Table 8.8

Comparison of the sample cases with the national sample HHAs: Four regions

Region	Sample cases Number	Percent	National sample Number	Percent
Total	8840	100.00	646	100.0
North	2572	29.1	192	29.7
South	2121	24.1	167	25.9
Midwest	2665	30.2	192	29.7
West	1482	16.8	95	14.7

Table 8.9

Number and percent distribution of sample cases:
State and region

Region/state	Number	Percent
Total	8840	100
Region I	**536**	**6.0**
Connecticut	108	1.2
Maine	35	0.4
Massachusetts	202	2.3
New Hampshire	101	1.1
Rhode Island	70	0.8
Vermont	20	0.2
Region II	**1003**	**11.3**
New Jersey	249	2.8
New York	732	8.3
Puerto Rico	22	0.2
Region III	**1033**	**11.8**
Delaware	25	0.3
District of Columbia	50	0.6
Maryland	97	1.1
Pennsylvania	634	7.2
Virginia	192	2.2
West Virginia	35	0.4
Region IV	**1645**	**18.7**
Alabama	176	2.0
Florida	373	4.2
Georgia	247	2.8
Kentucky	164	1.9
Mississippi	213	2.4
North Carolina	228	2.6
South Carolina	95	1.1
Tennessee	149	1.7

Table 8.9 (cont.)

Number and percent distribution of sample cases: State and region

Region/state	Number	Percent
Region V	**2038**	**23.0**
Illinois	419	4.7
Indiana	203	2.3
Michigan	458	5.2
Minnesota	171	1.9
Ohio	456	5.2
Wisconsin	331	3.7
Region VI	**476**	**5.4**
Arkansas	67	0.8
Louisiana	56	0.6
New Mexico	43	0.5
Oklahoma	17	0.2
Texas	293	3.3
Region VII	**627**	**7.2**
Iowa	217	2.5
Kansas	95	1.1
Missouri	236	2.7
Nebraska	79	0.9
Region VIII	**341**	**3.9**
Colorado	95	1.1
Montana	54	0.6
North Dakota	27	0.3
South Dakota	30	0.3
Utah	104	1.2
Wyoming	31	0.4
Region IX	**835**	**9.4**
Arizona	155	1.8
California	632	7.1
Hawaii	10	0.1
Nevada	38	0.4

Table 8.9 (cont.)

Number and percent distribution of sample cases:
State and region

Region/state	Number	Percent
Region X	**306**	**3.5**
Alaska	19	0.2
Idaho	97	1.1
Oregon	15	0.2
Washington	175	2.0

Table 8.10

Number and percent distributions of cases:
Age groups

Age group	Number	Percent
Total	8,410	100.0
Less than 65	525	6.2
65-69	1,210	13.5
70-74	1,674	19.8
75-79	1,843	21.9
80-84	1,621	19.3
85 and over	1,537	18.3

Table 8.11

Number and percent distributions of cases:
Marital status

Marital status	Number	Percent
Total	8,211	100.0
Married	3,638	44.3
Widowed	3,721	45.3
Divorced	283	3.4
Never married	515	6.3
Separated	54	0.7

Table 8.12

Number and percent distributions of cases: Sex

Sex	Number	Percent
Total	8,833	100.0
Male	3,383	38.3
Female	5,450	61.7

Table 8.13

Number and percent distributions of cases: Race

Race	Number	Percent
Total	8,118	100.0
White	6,952	85.6
Black	910	11.2
Hispanic	213	2.6
Asian	29	0.4
American Indian	14	0.2

Table 8.14

Number and percent distributions of cases:
Living arrangement

Living arrangement	Number	Percent
Total	8,786	100.0
Alone	2,729	31.1
Spouse only	3,038	34.6
Spouse/children	1,355	15.4
Family/relative	1,273	14.5
Non-relative	391	4.5

Table 8.15

Number and percent distributions of cases:
Available caregiver

Caregiver	Number	Percent
Total	8,444	100.0
Self	2,323	26.5
Spouse only	2,391	27.3
Informal	3,330	38.0
Formal/paid	723	8.2

Table 8.16

Number and percent distributions of cases: Housing

Housing	Number	Percent
Total	8,342	100.0
Detached house	5,802	69.6
Apartment	1,719	20.6
Mobile home	367	4.4
Townhouse	198	2.4
Personal care home	180	2.2
Rented room	76	0.9

Table 8.17

Number and percent distributions of cases: Pets in residence

Pets	Number	Percent
Total	4,455	100.0
Yes	899	20.2
No	3,556	79.8

Table 8.18

Number and percent distributions of cases: Comprehension level

Comprehension	Number	Percent
Total	8,797	100.0
Able	6,442	73.2
Partially able	1,965	22.4
Unable	390	4.4

Table 8.19

Number and percent distributions of cases: communication level

Communication	Number	Percent
Total	8,796	100.0
Able	7,307	83.1
Partially able	1,219	13.9
Unable	270	3.1

Table 8.20

Number and percent distributions of mental status conditions: Cases

	Mental Status Conditions	
Mental status	Number	Percent
Total	8,840	–
Oriented	7,533	85.2
Comatose	50	0.6
Forgetful	2,647	29.9
Depressed	1,453	16.4
Disoriented	897	10.1
Lethargic	814	9.2
Agitated	519	5.9
Other	924	5.9

Table 8.21

Number and percent distributions of cases: Prognosis

Prognosis	Number	Percent
Total	8,747	52.5
Poor	577	6.6
Guarded	1,404	16.1
Fair	4,196	48.0
Good	2,494	28.5
Excellent	76	0.9

Table 8.22

Number and percent distributions of cases:
Admission status

Admission status	Number	Percent
Total	8,720	100.0
New Admission	6,398	73.4
Re-admission	2,322	26.6

Table 8.23

Number and percent distributions of cases:
Referral source

Referral source	Number	Percent
Total	8,765	100.0
Acute care hospital	6,408	73.1
Physician Office	1,247	14.2
Nursing home	190	2.2
Rehab Hospital	158	1.8
Family/friend	361	4.1
Self	92	1.0
Outpatient clinic	108	1.2
Other agency	201	2.3

Table 8.24

Number and percent distributions of cases: Discharge status

Status	Number	Percent
Total	8,713	100.0
Recovered	787	9.0
Improved	3,788	43.5
No Change	444	5.1
Stabilized	1,510	17.3
Deteriorated	1,143	13.1
Expired in Home	540	6.2
Expired in Hospital	501	5.8

Table 8.25

Number and percent distributions of cases: Discharge disposition

Disposition	Number	Percent
Total	8,741	100.0
Self/Family	5,696	65.2
Hospital	1,283	14.7
Nursing Home	309	3.5
Adult Home	102	1.2
Other Institution	32	0.4
Other Program	226	2.6
Other Agency	98	1.1
Other	995	11.4

Table 8.26

Number and percent distributions of cases: Reason for discharge

Discharge Reason	Number	Percent
Total	8,741	100.0
Service Not Needed	5,665	64.8
Moved	240	2.7
Refuse Treatment	129	1.5
Caregiver Available	30	0.3
Noncompliant	79	0.9
Unsafe for Staff	15	0.2
Other	2,583	29.6

Table 8.27

Number and percent distributions of cases:
Discharge goals accomplished

Goals	Number	Percent
Total	8,737	100.0
Goals Met	4,927	56.4
Partially Met	2,635	30.2
Goals Not Met	905	10.4
Not Applicable	270	3.1

Table 8.28

Number and percent distributions of cases:
Care motivation

Motivation	Number	Percent
Total	8,362	100.0
Motivated	5,047	60.4
Partially	2,062	24.7
Not Motivated	631	7.5
Not Applicable	622	7.4

Table 8.29

Frequency comparisons of levels of performance of cases: Functional activity (ADL) on admission and discharge

	Bathing			
	Admission		Discharge	
Level	Number	Percent	Number	Percent
Independent	2,003	23.0	3,508	41.6
Assistance	4,816	55.2	3,365	39.9
Dependent	1,905	21.8	1,565	18.5

	Dressing			
	Admission		Discharge	
Level	Number	Percent	Number	Percent
Independent	2,820	32.4	4,171	49.6
Assistance	4,269	49.1	2,804	33.3
Dependent	1,606	18.5	1,436	17.1

	Toileting			
	Admission		Discharge	
Level	Number	Percent	Number	Percent
Independent	3,996	45.8	4,823	57.0
Assistance	3,449	39.5	2,419	28.6
Dependent	1,277	14.6	1,214	14.4

Table 8.29 (cont.)

Frequency comparisons of levels of performance of cases: Functional activity (ADL) on admission and discharge

	Transfer			
	Admission		Discharge	
Level	Number	Percent	Number	Percent
Independent	3,546	40.7	4,720	55.7
Assistance	3,964	45.4	2,621	30.9
Dependent	1,213	13.9	1,130	13.3

	Continence			
	Admission		Discharge	
Level	Number	Percent	Number	Percent
Independent	5,841	67.2	6,004	71.2
Assistance	1,618	18.6	1,288	15.3
Dependent	1,229	14.1	1,136	13.5

	Feeding			
	Admission		Discharge	
Level	Number	Percent	Number	Percent
Independent	6,589	75.6	6,561	77.6
Assistance	1,429	16.4	1,054	12.5
Dependent	700	8.0	838	9.9

Table 8.29 (cont.)

Frequency comparisons of levels of performance of cases: Functional activity (ADL) on admission and discharge

	Walking			
	Admission		Discharge	
Level	Number	Percent	Number	Percent
Independent	2,011	23.0	3,268	38.6
Assistance	5,192	59.4	3,801	44.0
Dependent	1,536	17.6	1,403	16.6

	Telephone			
	Admission		Discharge	
Level	Number	Percent	Number	Percent
Independent	5,645	71.6	5,560	72.4
Assistance	1,016	12.9	825	10.7
Dependent	1,222	15.5	1,295	16.9

	Medications			
	Admission		Discharge	
Level	Number	Percent	Number	Percent
Independent	2,788	32.3	4,250	50.6
Assistance	3,919	45.4	2,518	30.0
Dependent	1,932	22.4	1,627	19.4

Table 8.30

Mean comparisons of five ADL scales of cases[1]: Admission and discharge:

Type	Admission		Discharge		Change
ADL scale	Number	Mean visits	Number	Mean visits	
GU ADL	6,701	14.59	6,574	13.40	-1.19
RUGS ADL	7,531	4.54	7,415	4.11	-0.43
Katz (6)	7,683	2.40	7,683	1.71	-0.69
Katz (7)	7,683	3.14	7,683	2.95	-0.19
IADL (2)	6,800	3.16	6,757	2.87	-0.29

1/ Episode less than one year

Table 8.31

Frequency comparisons of GU ADL scale scores of cases: Admission, discharge, and differences

	Admission		Discharge		Difference		
GU ADL Score	Number	Percent	Number	Percent	Percent	Number	Percent
9	600	7.8	1059	14.3	-14	2	0.0
10	673	8.7	1260	17.0	-13	1	0.0
11	701	9.1	862	11.6	-12	6	0.1
12	677	8.1	582	7.8	-11	7	0.1
13	702	9.1	449	6.1	-10	12	0.2
14	763	9.9	461	6.2	-9	29	0.4
15	718	9.3	413	5.6	-8	28	0.4
16	513	6.7	346	4.7	-7	72	1.0
17	391	5.1	250	3.4	-6	139	1.9
18	343	4.5	255	3.4	-5	330	4.5
19	229	3.0	158	2.1	-4	379	5.1
20	178	2.3	146	2.0	-3	498	6.7
21	149	1.9	118	1.6	-2	695	9.4
22	138	1.8	95	1.3	-1	787	10.7
23	122	1.6	131	1.8	0	3762	50.9
24	125	1.6	124	1.7	1	144	1.9
25	115	1.5	156	2.1	2	91	1.2
26	128	1.7	168	2.3	3	66	0.9
27	436	5.7	385	5.2	4	54	0.7
					5	60	0.8
					6	50	0.7
					7	63	0.9
					8	23	0.3
					9	25	0.3
					10	19	0.3
					11	14	0.2
					12	12	0.2
					13	6	0.1
					14	15	0.2

Table 8.32

Frequency distributions of the one hundred forty-seven nursing diagnoses: Multiple, unduplicated categories, and cases

Nursing diagnoses	RN DXs (multi)		RX DXs (undup.)		Cases
	#	%	#	%	%
Total	40361	100.00	40361	100	456.57
Family Coping, Impaired	168	0.42	168	0.42	1.90
Compromised	6	0.01	6	0.01	0.07
Disabled	6	0.01	6	0.01	0.07
Health Seeking Behavior	3	0.01	3	0.01	0.03
Individual Coping, Impaired	357	0.89	357	0.89	4.04
Adjustment, Impaired	11	0.03	11	0.03	0.12
Conflict: Decisional	1	0.00	1	0.00	0.01
Coping: Defensive	2	0.00	2	0.00	0.02
Denial, Impaired	4	0.01	4	0.01	0.05
Noncompliance	64	0.16	64	0.16	0.72
Care Management	34	0.08	34	0.08	0.38
Diet/Fluids	112	0.28	112	0.28	1.27
Medications	284	0.71	284	0.71	3.21
Medical Orders/Regimes	96	0.24	96	0.24	1.09
Safety Precautions	5	0.01	5	0.01	0.06
Treatments/Procedures/Interventions	35	0.09	35	0.09	0.40
Communication, Impaired	128	0.32	128	0.32	1.45
Verbal	53	0.13	53	0.13	0.60
Bowel Elimination, Altered	853	2.12	853	2.12	9.65
Bowel Incontinence	98	0.24	98	0.24	1.11
Constipation: Colonic	16	0.04	16	0.04	0.18
Constipation: Perceived	28	0.07	28	0.07	0.32
Diarrhea	134	0.33	134	0.33	1.52
Constipation: Unspecified	444	1.10	444	1.10	5.02
Fecal Impaction	57	0.14	57	0.14	0.64
Cardiac Output, Altered	1819	4.52	1819	4.52	20.58
Fluid Volume, Altered	370	0.92	370	0.92	4.19
Fluid Volume, Deficit	244	0.61	244	0.61	2.76
Fluid Volume, Deficit: Risk	53	0.13	53	0.13	0.60
Fluid Volume, Excess	492	1.22	492	1.22	5.57
Fluid Volume, Excess: Risk	16	0.04	16	0.04	0.18
Injury: Risk	775	1.93	775	1.93	8.77
Aspiration	3	0.01	3	0.01	0.03
Poisoning	1	0.00	1	0.00	0.01
Suffocation/ Choking	2	0.00	2	0.00	0.02
Trauma	31	0.08	31	0.08	0.35
Nutrition, Altered	969	2.41	969	2.41	10.96

Table 8.32 (cont.)

Frequency distributions of the one hundred forty-seven nursing diagnoses: Multiple, unduplicated categories, and cases

Nursing diagnoses	RN DXs (multi)		RX DXs (undup.)		Cases
	#	%	#	%	%
Less than Body Requirement	609	1.51	609	1.51	6.89
More than Body Requirement	55	0.14	55	0.14	0.62
More than Body Requirements: Risk	8	0.02	8	0.02	0.09
Physical Regulation, Altered	157	0.39	157	0.39	1.78
Hyperthermia	32	0.08	32	0.08	0.36
Hypothermia	4	0.01	4	0.01	0.05
Thermoregulation, Impaired	9	0.02	9	0.02	0.10
Infection: Risk	588	1.46	588	1.46	6.65
Infection: Unspecified	32	0.08	32	0.08	0.36
Respiration, Altered	1451	3.61	1451	3.61	16.41
Airway Clearance, Impaired	97	0.24	97	0.24	1.10
Breathing Pattern, Impaired	317	0.79	317	0.79	3.59
Gas Exchange, Impaired	324	0.81	324	0.81	3.67
Tissue Integrity, Altered	1092	2.72	1092	2.72	12.35
Oral Mucous Membranes, Impaired	37	0.09	37	0.09	0.42
Skin Integrity, Impaired	1237	3.08	1237	3.08	13.99
Skin Integrity, Impaired: Risk	307	0.76	307	0.76	3.47
Skin Integrity: Invasive	808	2.01	808	2.01	9.14
Tissue Perfusion, Altered	195	0.48	195	0.48	2.21
Cardiopulmonary	572	1.42	572	1.42	6.47
Cerebral	788	1.96	788	1.96	8.91
Gastrointestinal	691	1.72	691	1.72	7.82
Peripheral	174	0.43	174	0.43	1.97
Renal	93	0.23	93	0.23	1.05
Endocrine	954	2.37	954	2.37	10.79
Immunological	54	0.13	54	0.13	0.61
Musculoskeletal	782	1.94	782	1.94	8.85
Other System Condition	1522	3.78	1522	3.78	17.22
Urinary Elimination, Altered	1235	3.07	1235	3.07	13.97
Incontinence: Functional	49	0.12	49	0.12	0.55
Incontinence: Reflex	4	0.01	4	0.01	0.05
Incontinence: Stress	11	0.03	11	0.03	0.12
Incontinence: Urge	2	0.00	2	0.00	0.02
Incontinence: Total	333	0.83	333	0.83	3.77
Retention	104	0.26	104	0.26	1.18
Anxiety	309	0.77	309	0.77	3.50
Comfort, Altered	1001	2.49	1001	2.49	11.32
Pain, Acute	76	0.19	76	0.19	0.86
Pain, Chronic	177	0.44	177	0.44	2.00

Table 8.32 (cont.)

Frequency distributions of the one hundred forty-seven nursing diagnoses: Multiple, unduplicated categories, and cases

Nursing diagnoses	RN DXs (multi)		RX DXs (undup.)		Cases
	#	%	#	%	%
Pain, Unspecified	318	0.79	318	0.79	3.60
Fear	39	0.1	39	0.10	0.44
Grieving	32	0.08	32	0.08	0.36
Anticipatory	34	0.08	34	0.08	0.38
Dysfunctional	3	0.01	3	0.01	0.03
Post-Trauma Response	1	0.00	1	0.00	0.01
Violence: Risk	6	0.01	6	0.01	0.07
Dying Process	63	0.16	63	0.16	0.71
Knowledge Deficit	817	2.03	817	2.03	9.24
Care Management	597	1.48	597	1.48	6.75
Diagnostic/ Laboratory Tests	22	0.05	22	0.05	0.25
Diet/ Fluids	863	2.15	863	2.15	9.76
Disease Processes/S&S/General	1143	2.84	1143	2.84	12.93
Medications	2037	5.06	2037	5.06	23.04
Medical Orders/Regimes	512	1.27	512	1.27	5.79
Safety Precautions	252	0.63	252	0.63	2.85
Treatments/Procedures/Interventions	974	2.42	974	2.42	11.02
Thought Processes, Altered	838	2.08	838	2.08	9.48
Medication: Risk	459	1.14	459	1.14	5.19
Activity, Altered	469	1.17	469	1.17	5.31
Activity Intolerance	1181	2.94	1181	2.94	13.36
Activity Intolerance: Risk	11	0.03	11	0.03	0.12
Diversional Activity Deficit	18	0.04	18	0.04	0.20
Fatigue	59	0.15	59	0.15	0.67
Physical Mobility, Impaired	1972	4.90	1972	4.90	22.31
Sleep Pattern Disturbance	122	0.30	122	0.30	1.38
Bathing/Hygiene Deficit	89	0.22	89	0.22	1.01
Dressing/Grooming Deficit	19	0.05	19	0.05	0.21
Feeding Deficit	52	0.13	52	0.13	0.59
Swallowing, Impaired	90	0.22	90	0.22	1.02
Growth and Development, Altered	2	0.00	2	0.00	0.02
Health Maintenance, Altered	350	0.87	350	0.87	3.96
Home Maint Management, Impaired	335	0.83	335	0.83	3.79
Toileting Deficit	9	0.02	9	0.02	0.10
Self Care Deficit	1339	3.33	1339	3.33	15.15
ADLs: Total	503	1.25	503	1.25	5.69
IADLs: Total	25	0.06	25	0.06	0.28
Hopelessness	2	0.00	2	0.00	0.02
Powerlessness	10	0.02	10	0.02	0.11

Table 8.32 (cont.)

Frequency distributions of the one hundred forty-seven nursing diagnoses: Multiple, unduplicated categories, and cases

Nursing diagnoses	RN DXs (multi)		RX DXs (undup.)		Cases
	#	%	#	%	%
Self Concept, Altered	50	0.12	50	0.12	0.57
Body Image Disturbance	38	0.09	38	0.09	0.43
Personal Identity Disturbance	3	0.01	3	0.01	0.03
Self-Esteem Disturbance:Chronic Low	9	0.02	9	0.02	0.10
Self-Esteem Disturbance:Situational	1	0.00	1	0.00	0.01
Sensory Perception, Altered	44	0.11	44	0.11	0.50
Auditory	59	0.15	59	0.15	0.67
Kinesthetic	1	0.00	1	0.00	0.01
Olfactory	2	0.00	2	0.00	0.02
Tactile	6	0.01	6	0.01	0.07
Visual	133	0.33	133	0.33	1.50
Unilateral Neglect	1	0.00	1	0.00	0.01
Family Processes, Altered	41	0.10	41	0.10	0.46
Role Performance, Altered	28	0.07	28	0.07	0.32
Parenting, Altered	2	0.00	2	0.00	0.02
Sexuality Patterns, Altered	4	0.01	4	0.01	0.05
Socialization, Altered	14	0.03	14	0.03	0.16
Social Interaction, Impaired	7	0.02	7	0.02	0.08
Social Isolation	28	0.07	28	0.07	0.32
Spiritual State, Altered	13	0.03	13	0.03	0.15
Spiritual Distress	5	0.01	5	0.01	0.06

Table 8.33

Frequency distributions of the forty-two nursing diagnoses major categories: Multiple, unduplicated categories, and cases

Nursing diagnoses major categories	RN DXs (multi)		RX DXs (undup.)		Cases
	#	%	#	%	%
Total	80581	200.00	66289	200.00	749.88
Family Coping, Impaired	180	0.45	180	0.54	2.04
Health Seeking Behavior	3	0.01	3	0.01	0.03
Individual Coping, Impaired	375	0.93	373	1.13	4.22
Noncompliance	630	1.57	496	1.50	5.61
Communication, Impaired	181	0.45	179	0.54	2.02
Bowel Elimination, Altered	1630	4.05	1557	4.71	17.61
Cardiac Output, Altered	1819	4.52	1819	5.50	20.58
Fluid Volume, Altered	1175	2.92	1101	3.33	12.45
Injury: Risk	812	2.02	802	2.42	9.07
Nutrition, Altered	1641	4.08	1606	4.86	18.17
Physical Regulation, Altered	822	2.04	807	2.44	9.13
Respiration, Altered	2189	5.44	1944	5.88	21.99
Tissue Integrity, Altered	3481	8.65	3151	9.53	35.64
Tissue Perfusion, Altered	5825	14.48	3917	11.84	44.31
Urinary Elimination, Altered	1738	4.32	1630	4.93	18.44
Anxiety	309	0.77	309.00	0.93	3.50
Comfort, Altered	1572	3.91	1521	4.60	17.21
Fear	39	0.1	39.00	0.12	0.44
Grieving	69	0.17	69	0.21	0.78
Post-Trauma Response	1	0.00	1	0.00	0.01
Violence: Risk	6	0.01	6	0.02	0.07
Dying Process	63	0.16	63	0.19	0.71
Knowledge Deficit	7217	17.94	3717	11.24	42.05
Thought Processes, Altered	838	2.08	838	2.53	9.48
Medication: Risk	459	1.14	459	1.39	5.19
Activity, Altered	3832	9.53	3228	9.76	36.52
Bathing/Hygiene Deficit	89	0.22	89	0.27	1.01
Dressing/Grooming Deficit	19	0.05	19	0.06	0.21
Feeding Deficit	142	0.35	133	0.40	1.50
Growth and Development, Altered	2	0.00	2	0.01	0.02
Health Maintenance, Altered	350	0.87	350	1.06	3.96
Home Maint Management, Impaired	335	0.83	335	1.01	3.79
Toileting Deficit	9	0.02	9	0.03	0.10
Self Care Deficit	1867	4.64	1846	5.58	20.88
Meaningfulness, Altered	12	0.03	12	0.04	0.14
Self Concept, Altered	101	0.25	97	0.29	1.10

Table 8.33 (cont.)

Frequency distributions of the forty-two nursing diagnoses major categories: Multiple, unduplicated categories, and cases

Nursing diagnoses major categories	RN DXs (multi)		RX DXs (undup.)		Cases
	#	%	#	%	%
Sensory Perception, Altered	246	0.61	228	0.69	2.58
Family Processes, Altered	41	0.10	41	0.12	0.46
Role Performance, Altered	30	0.07	30	0.09	0.34
Sexuality Patterns, Altered	4	0.01	4	0.01	0.05
Socialization, Altered	49	0.12	46	0.14	0.52
Spiritual State, Altered	18	0.04	18	0.05	0.20

Table 8.34

Frequency distributions of the fifty one nursing diagnoses expanded major categories: Multiple, unduplicated categories, and cases

Nursing diagnoses expanded major categories	RN DXs (multi)		RX DXs (undup.)		Cases
	#	%	#	%	%
Total	40361	100	35123	100	397.32
Family Coping, Impaired	180	0.45	180	0.51	2.04
Health Seeking Behavior	3	0.01	3	0.01	0.03
Individual Coping, Impaired	375	0.93	373	1.07	4.22
Noncompliance	630	1.57	496	1.42	5.61
Communication, Impaired	181	0.45	179	0.51	2.02
Bowel Elimination, Altered	1630	4.05	1557	4.45	17.61
Cardiac Output, Altered	1819	4.52	1819	5.20	20.58
Fluid Volume, Altered	1175	2.92	1101	3.15	12.45
Injury: Risk	812	2.02	802	2.29	9.07
Nutrition, Altered	1641	4.08	1606	4.59	18.17
Physical Regulation, Altered	822	2.04	807	2.31	9.13
Respiration, Altered	2189	5.44	1944	5.56	21.99
Tissue Integrity, Altered	3481	8.65	3151	9.01	35.64
Tissue Perfusion, Altered	195	0.48	195	0.56	2.21
Cardiopulmonary	572	1.42	572	1.64	6.47
Cerebral	788	1.96	788	2.25	8.91
Gastrointestinal	691	1.72	691	1.98	7.82
Peripheral	174	0.43	174	0.50	1.97
Renal	93	0.23	93	0.27	1.05
Endocrine	954	2.37	954	2.73	10.79
Immunological	54	0.13	54	0.15	0.61
Musculoskeletal	782	1.94	782	2.24	8.85
Other System Condition	1522	3.78	1522	4.35	17.22
Urinary Elimination, Altered	1738	4.32	1630	4.66	18.44
Anxiety	309	0.77	309	0.88	3.50
Comfort, Altered	1572	3.91	1521	4.35	17.21
Fear	39	0.10	39	0.11	0.44
Grieving	69	0.17	69	0.20	0.78
Post-Trauma Response	1	0.00	1	0.00	0.01
Violence: Risk	6	0.01	6	0.02	0.07
Dying Process	63	0.16	63	0.18	0.71
Knowledge Deficit	7217	17.94	3717	10.63	42.05
Thought Processes, Altered	838	2.08	838	2.40	9.48
Medication: Risk	459	1.14	459	1.31	5.19
Activity, Altered	3832	9.53	3228	9.23	36.52
Bathing/Hygiene Deficit	89	0.22	89	0.25	1.01

Table 8.34 (cont.)

Frequency distributions of the fifty one nursing diagnoses expanded major categories: Multiple, unduplicated categories, and cases

Nursing diagnoses expanded major categories	RN DXs (multi)		RX DXs (undup.)		Cases
	#	%	#	%	%
Dressing/Grooming Deficit	19	0.05	19	0.05	0.21
Feeding Deficit	142	0.35	133	0.38	1.50
Growth and Development, Altered	2	0.00	2	0.01	0.02
Health Maint., Altered	350	0.87	350	1.00	3.96
Home Maint. Managt., Impaired	335	0.83	335	0.96	3.79
Toileting Deficit	9	0.02	9	0.03	0.10
Self Care Deficit	1867	4.64	1846	5.28	20.88
Meaningfulness, Altered	12	0.03	12	0.03	0.14
Self Concept, Altered	101	0.25	97	0.28	1.10
Sensory Perception, Altered	246	0.61	228	0.65	2.58
Family Processes, Altered	41	0.10	41	0.12	0.46
Role Performance, Altered	30	0.07	30	0.09	0.34
Sexuality Patterns, Altered	4	0.01	4	0.01	0.05
Socialization, Altered	49	0.12	46	0.13	0.52
Spiritual State, Altered	18	0.04	18	0.05	0.20

Table 8.35

Frequency distributions of range of one hundred forty-seven nursing diagnoses: Cases

Range	Number	Percent
1	927	10.5
2	1322	15
3	1518	17.2
4	1411	16
5	1025	11.6
6	821	9.3
7	569	6.4
8	394	4.5
9	267	3
10	186	2.1
11	135	1.5
12	80	0.9
13	64	0.7
14	42	0.5
15	34	0.4
16	18	0.2
17	12	0.1
18	9	0.1
19	6	0.1

Table 8.36

Frequency distributions of range of forty-two nursing diagnoses major categories: Cases

Range	Number	Percent
1	1171	13.2
2	1812	20.5
3	1737	19.6
4	1423	16.1
5	1001	11.3
6	685	7.7
7	415	4.7
8	252	2.9
9	168	1.9
10	82	0.9
11	39	0.4
12	21	0.2
13	17	0.2
14	11	0.1
15	4	0
16	1	0
17	1	0

Table 8.37

Frequency distributions of range of fifty one nursing diagnoses expanded major categories: Cases

Range	Number	Percent
1	1079	12.2
2	1613	18.2
3	1716	19.4
4	1465	16.6
5	1010	11.4
6	749	8.5
7	453	5.1
8	274	3.1
9	218	2.5
10	123	1.4
11	55	0.6
12	37	0.4
13	24	0.3
14	14	0.2
15	7	0.1
16	2	0
17	1	0

Table 8.38

Frequency distributions of the nine human response patterns: Multiple, unduplicated categories, and cases

Human response patterns	RN DXs (multi)		RX DXs (undup.)		Cases
	#	%	#	%	%
Total	80445	199.66	40489	199.50	458.02
Choosing	1172	2.91	945	4.67	10.69
Communicating	179	0.45	177	0.88	2.00
Exchanging	21078	52.41	7848	38.80	88.78
Feeling	2047	5.09	1802	8.91	20.38
Knowing	8503	21.14	4381	21.66	49.56
Moving	6627	16.48	4524	22.37	51.18
Perceiving	345	0.86	317	1.57	3.59
Relating	117	0.29	113	0.56	1.28
Value	16	0.04	16	0.08	0.18

Table 8.39

Frequency distributions of range of nine human response patterns: Cases

Range	Number	Percent
1	2266	25.6
2	3150	35.6
3	2252	25.5
4	887	10
5	225	2.5
6	50	0.6
7	9	0.1
8	1	0

Table 8.40

Frequency distributions of the eleven nursing diagnoses functional health patterns: Multiple, unduplicated categories, and cases

Functional health patterns	RN DXs (multi)		RX DXs (undup.)		Cases
	#	%	#	%	%
Total	40361	100.00	23170	100.00	262.10
Health Perception/Health Management	2256	5.61	1875	8.14	21.21
Nutritional-Metabolic	7209	17.92	4781	20.76	54.08
Elimination	3368	8.37	2671	11.60	30.21
Activity-Exercise	15855	39.42	7199	31.26	81.44
Cognitive-Perceptual	122	0.30	122	0.53	1.38
Sleep-Rest	9873	24.55	4987	21.66	56.41
Self-Perception/Selp-Concept	520	1.29	470	2.04	5.32
Role-Relationship	433	1.08	402	1.75	4.55
Sexuality-Reproductive	4	0.01	4	0.02	0.05
Coping-Stress Tollerance	562	1.40	500	2.17	5.66
Value-Belief	18	0.04	18	0.08	0.20

Table 8.41

Frequency distributions of range of eleven nursing diagnoses functional health patterns: Cases

Range	Number	Percent
1	1768	20
2	2745	31.1
3	2329	26.3
4	1287	14.6
5	541	6.1
6	130	1.5
7	30	0.3
8	8	0.1
9	2	0

Table 8.42

Frequency distributions of the twenty nursing diagnoses home health care components: Multiple, unduplicated categories, and cases

Home health care components	RN DXs (multi)		RX DXs (undup.)		Cases
	#	%	#	%	%
Total	40361	100.00	33307	100.00	376.78
Activity	4614	11.47	3742	11.28	42.33
Cardiac Output	2391	5.94	2329	7.02	26.35
Cognitive	8843	21.99	4605	13.88	52.09
Coping	637	1.58	556	1.68	6.29
Digestive	2321	5.77	2069	6.24	23.40
Fluid	1175	2.92	1101	3.32	12.45
Health Behavior	1320	3.28	1063	3.21	12.02
Injury/Safety	812	2.02	802	2.42	9.07
Medication	459	1.14	459	1.38	5.19
Metabolic	1008	2.51	996	3.00	11.27
Nutritional	1641	4.08	1606	4.84	18.17
Physical Regulation	822	2.04	807	2.43	9.13
Respiratory	2189	5.44	1944	5.86	21.99
Role Relationship	380	0.94	358	1.08	4.05
Self-Concept	461	1.15	419	1.26	4.74
Self-Care	2126	5.29	1991	6.00	22.52
Sensory	1818	4.52	1689	5.09	19.11
Tissue Perfusion	1717	4.27	1692	5.10	19.14
Tissue/Skin Integrity	3655	9.09	3238	9.76	36.63
Urinary	1831	4.55	1700	5.13	19.23

Table 8.43

Frequency distributions of range of twenty nursing diagnoses home health care components: Cases

Range	Number	Percent
1	1118	12.6
2	1697	19.2
3	1800	20.4
4	1515	17.1
5	1032	11.7
6	689	7.8
7	426	4.8
8	265	3
9	160	1.8
10	68	0.8
11	37	0.4
12	19	0.2
13	12	0.1
14	2	0

Table 8.44

Frequency distributions of the one hundred sixty-six nursing intervention major categories: Multiple, unduplicated categories, and cases

Nursing intervention major categories	RN DXs (multi)		RX DXs (undup.)		Cases
	#	%	#	%	%
Total[1/]	73529	100.00	73529	100.00	831.78
Abuse Control	34	0.05	34	0.05	0.38
Activity Care	766	1.04	766	1.04	8.67
Cardiac Rehabilitation	129	0.18	129	0.18	1.46
Energy Conservation	676	0.92	676	0.92	7.65
Allergic Reaction Care	6	0.01	6	0.01	0.07
Bladder Care	359	0.49	359	0.49	4.06
Bladder Training	80	0.11	80	0.11	0.90
Bladder Instillation	163	0.22	163	0.22	1.84
Body System Condition Care	1698	2.31	1698	2.31	19.21
Cardiopulmonary	3194	4.35	3194	4.35	36.13
Cardiovascular	1355	1.84	1355	1.84	15.33
Endocrine	255	0.35	255	0.35	2.88
Gastrointestinal	838	1.14	838	1.14	9.48
Genitourinary	908	1.24	908	1.24	10.27
Integumentary	971	1.32	971	1.32	10.98
Musculoskeletal	379	0.52	379	0.52	4.29
Neurological	676	0.92	676	0.92	7.65
Psychological	419	0.57	419	0.57	4.74
Other Condition	245	0.33	245	0.33	2.77
Bowel Care	1056	1.44	1056	1.44	11.95
Bowel Training	923	1.26	923	1.26	10.44
Enema	652	0.89	652	0.89	7.38
Disimpaction	117	0.16	117	0.16	1.32
Catheter Care	706	0.96	706	0.96	7.99
Catheter Insertion	894	1.22	894	1.22	10.11
Catheter Irrigation	76	0.10	76	0.10	0.86
Chemotherapy Care	66	0.09	66	0.09	0.75
Communication Care	39	0.05	39	0.05	0.44
Community Services	164	0.22	164	0.22	1.86
Adult Day Care	6	0.01	6	0.01	0.07
Hospice Care	70	0.10	70	0.10	0.79
Meals on Wheels	72	0.10	72	0.10	0.81
Other Service	309	0.42	309	0.42	3.50
Compliance Analysis	429	0.58	429	0.58	4.85
Diet/Fluids	249	0.34	249	0.34	2.82
Medical Regime	220	0.30	220	0.30	2.49
Medications	809	1.10	809	1.10	9.15

Table 8.44 (cont.)

Frequency distributions of the one hundred sixty-six nursing intervention major categories: Multiple, unduplicated categories, and cases

Nursing intervention major categories	RN DXs (multi)		RX DXs (undup.)		Cases
	#	%	#	%	%
Safety	17	0.02	17	0.02	0.19
Treatment Modality	422	0.57	422	0.57	4.77
Counseling Services	33	0.04	33	0.04	0.37
Coping	187	0.25	187	0.25	2.12
Stress Control	124	0.17	124	0.17	1.40
Decubitus Care	320	0.44	320	0.44	3.62
Stage 1	472	0.64	472	0.64	5.34
Stage 2	8	0.01	8	0.01	0.09
Stage 3	396	0.54	396	0.54	4.48
Stage 4	2	0.00	2	0.00	0.02
Diabetic Care	1361	1.85	1361	1.85	15.40
Finger Stick	490	0.67	490	0.67	5.54
Insulin Administration	362	0.49	362	0.49	4.10
Prefill Insulin	35	0.05	35	0.05	0.40
Reaction Control	300	0.41	300	0.41	3.39
Dialysis Care	10	0.01	10	0.01	0.11
Ear Care	9	0.01	9	0.01	0.10
Hearing Aid Control	2	0.00	2	0.00	0.02
Wax Removal	3	0.00	3	0.00	0.03
Edema Control	1011	1.38	1011	1.38	11.44
Emergency Care	507	0.69	507	0.69	5.74
Emotional Support	360	0.49	360	0.49	4.07
Spiritual Comfort	5	0.01	5	0.01	0.06
Eye Care	22	0.03	22	0.03	0.25
Cataract Care	44	0.06	44	0.06	0.50
Fluid Therapy	654	0.89	654	0.89	7.40
Hydration Status	1131	1.54	1131	1.54	12.79
Intake/Output	329	0.45	329	0.45	3.72
Foot Care	190	0.26	190	0.26	2.15
Fracture Care	37	0.05	37	0.05	0.42
Cast Care	19	0.03	19	0.03	0.21
Immobilizer	40	0.05	40	0.05	0.45
Gastrostomy/NG Tube Care	67	0.09	67	0.09	0.76
Tube Insertion	75	0.10	75	0.10	0.85
Tube Irrigation	11	0.01	11	0.01	0.12
Infection Control	1194	1.62	1194	1.62	13.51
Universal Precautions	2	0.00	2	0.00	0.02
Infusion Care	103	0.14	103	0.14	1.17
Intravenous	191	0.26	191	0.26	2.16

Table 8.44 (cont.)

Frequency distributions of the one hundred sixty-six nursing intervention major categories: Multiple, unduplicated categories, and cases

Nursing intervention major categories	RN DXs (multi)		RX DXs (undup.)		Cases
	#	%	#	%	%
Venous Catheter Care	47	0.06	47	0.06	0.53
Injection Administration	435	0.59	435	0.59	4.92
Vitamin B12	125	0.17	125	0.17	1.41
Medication Administration	4097	5.58	4097	5.58	46.35
Actions	1553	2.11	1553	2.11	17.57
Prefill Preparation	88	0.12	88	0.12	1.00
Side Effects	1300	1.77	1300	1.77	14.71
Mental Health Care	79	0.11	79	0.11	0.89
MH History	1	0.00	1	0.00	0.01
MH Promotion	4	0.01	4	0.01	0.05
MH Screening	47	0.06	47	0.06	0.53
MH Treatment Modality	95	0.13	95	0.13	1.07
Violence Control	7	0.01	7	0.01	0.08
Mobility Therapy	304	0.41	304	0.41	3.44
Ambulation	423	0.58	423	0.58	4.79
Assistive Device	240	0.33	240	0.33	2.71
Transfer	291	0.40	291	0.40	3.29
Mouth Care	68	0.09	68	0.09	0.77
Nursing Contact	144	0.20	144	0.20	1.63
Bill of Rights	2	0.00	2	0.00	0.02
Care Coordination	52	0.07	52	0.07	0.59
RN Status Report	111	0.15	111	0.15	1.26
Nutrition Care	2716	3.70	2716	3.70	30.72
Enteral/Parenteral Feeding	221	0.30	221	0.30	2.50
Feeding Technique	119	0.16	119	0.16	1.35
Regular Diet	19	0.03	19	0.03	0.21
Special Diet	1457	1.98	1457	1.98	16.48
Ostomy Care	333	0.45	333	0.45	3.77
Irrigation	17	0.02	17	0.02	0.19
Oxygen Therapy Care	460	0.63	460	0.63	5.20
Pacemaker Care	37	0.05	37	0.05	0.42
Pain Control	1358	1.85	1358	1.85	15.36
Comfort Care	140	0.19	140	0.19	1.58
Perineal Care	66	0.09	66	0.09	0.75
Personal Care	666	0.91	666	0.91	7.53
ADLs	19	0.03	19	0.03	0.21
Bedbound Care	508	0.69	508	0.69	5.75
IADLs	17	0.02	17	0.02	0.19
Physical Health Care	201	0.27	201	0.27	2.27

Table 8.44 (cont.)

Frequency distributions of the one hundred sixty-six nursing intervention major categories: Multiple, unduplicated categories, and cases

Nursing intervention major categories	RN DXs (multi)		RX DXs (undup.)		Cases
	#	%	#	%	%
Examination	1055	1.44	1055	1.44	11.93
Health Promotion	9	0.01	9	0.01	0.10
History	4	0.01	4	0.01	0.05
Measurements	77	0.10	77	0.10	0.87
Specimen Analysis	329	0.45	329	0.45	3.72
Physician Contact	91	0.12	91	0.12	1.03
Medical Regime	244	0.33	244	0.33	2.76
MD Status Report	1661	2.26	1661	2.26	18.79
Professional/Ancillary Service	43	0.06	43	0.06	0.49
Home Health Aide	727	0.99	727	0.99	8.22
Medical Social Worker	629	0.86	629	0.86	7.12
Nurse Specialist	28	0.04	28	0.04	0.32
Occupational Therapist	102	0.14	102	0.14	1.15
Physical Therapist	404	0.55	404	0.55	4.57
Speech Therapist	35	0.05	35	0.05	0.40
Other Caregiver	292	0.40	292	0.40	3.30
Other Professional	154	0.21	154	0.21	1.74
Psychosocial Analysis	39	0.05	39	0.05	0.44
Home Situation	247	0.34	247	0.34	2.79
Interpersonal Dynamics	97	0.13	97	0.13	1.10
Radiation Therapy Care	42	0.06	42	0.06	0.48
Respiratory Care	316	0.43	316	0.43	3.57
Breathing Exercises	289	0.39	289	0.39	3.27
Chest Physiotherapy	219	0.30	219	0.30	2.48
Inhalation Therapy	315	0.43	315	0.43	3.56
Restorative Care	2703	3.68	2703	3.68	30.58
Exercises	407	0.55	407	0.55	4.60
Safety Precautions	1620	2.20	1620	2.20	18.33
Environmental Hazard	149	0.20	149	0.20	1.69
Equipment Care	316	0.43	316	0.43	3.57
Sleep Pattern Control	15	0.02	15	0.02	0.17
Skin Care	943	1.28	943	1.28	10.67
Skin Breakdown Control	21	0.03	21	0.03	0.24
Specimen Collection	29	0.04	29	0.04	0.33
Blood	2055	2.80	2055	2.80	23.25
Stool	16	0.02	16	0.02	0.18
Urine	212	0.29	212	0.29	2.40
Other Specimen	39	0.05	39	0.05	0.44
Symptom Control	1307	1.78	1307	1.78	14.79

Table 8.44 (cont.)

Frequency distributions of the one hundred sixty-six nursing intervention major categories: Multiple, unduplicated categories, and cases

Nursing intervention major categories	RN DXs (multi)		RX DXs (undup.)		Cases
	#	%	#	%	%
Terminal Care	136	0.19	136	0.19	1.54
Dying/Death Measures	47	0.06	47	0.06	0.53
Funeral Arrangements	12	0.02	12	0.02	0.14
Tracheostomy Care	76	0.10	76	0.10	0.86
Vital Signs	2254	3.07	2254	3.07	25.50
Weight Control	631	0.86	631	0.86	7.14
Wound Care	1802	2.45	1802	2.45	20.38
Drainage Tube Care	63	0.09	63	0.09	0.71
Dressing Change	1695	2.31	1695	2.31	19.17
Incision Care	174	0.24	174	0.24	1.97

1/ Includes unknown variables: 898 1.22 898 1.56 10.16

Table 8.45

Frequency distributions of the fifty-six nursing intervention major categories: Multiple, unduplicated categories, and cases

Nursing interventions	RN DXs (multi)		RX DXs (undup.)		Cases
	#	%	#	%	%
Total[1/]	147017	200	116663	200	1319.7
Abuse Control	34	0.05	34	0.06	0.38
Activity Care	1571	2.14	1394	2.39	15.77
Allergic Reaction Care	6	0.01	6	0.01	0.07
Bladder Care	602	0.82	579	0.99	6.55
Body System Condition Care	10938	14.88	5215	8.94	58.99
Bowel Care	2748	3.74	2081	3.57	23.54
Catheter Care	1676	2.28	1083	1.86	12.25
Chemotherapy Care	66	0.09	66	0.11	0.75
Communication Care	39	0.05	39	0.07	0.44
Community Services	621	0.85	577	0.99	6.53
Compliance Analysis	2146	2.92	1674	2.87	18.94
Counseling Services	344	0.47	318	0.55	3.60
Decubitus Care	1198	1.63	900	1.54	10.18
Diabetic Care	2548	3.47	1556	2.67	17.60
Dialysis Care	10	0.01	10	0.02	0.11
Ear Care	14	0.02	13	0.02	0.15
Edema Control	1011	1.38	1011	1.73	11.44
Emergency Care	507	0.69	507	0.87	5.74
Emotional Support	365	0.50	363	0.62	4.11
Eye Care	66	0.09	60	0.10	0.68
Fluid Therapy	2114	2.88	1881	3.23	21.28
Foot Care	190	0.26	190	0.33	2.15
Fracture Care	96	0.13	93	0.16	1.05
Gastrostomy/NG Tube Care	153	0.21	126	0.22	1.43
Infection Control	1196	1.63	1194	2.05	13.51
Infusion Care	341	0.46	263	0.45	2.98
Injection Administration	560	0.76	535	0.92	6.05
Medication Administration	7038	9.58	4965	8.51	56.17
Mental Health Care	233	0.32	212	0.36	2.40
Mobility Therapy	1258	1.71	1049	1.80	11.87
Mouth Care	68	0.09	68	0.12	0.77
Nursing Contact	309	0.42	304	0.52	3.44
Nutrition Care	4532	6.17	4055	6.95	45.87
Ostomy Care	350	0.48	334	0.57	3.78
Oxygen Therapy Care	460	0.63	460	0.79	5.20
Pacemaker Care	37	0.05	37	0.06	0.42
Pain Control	1498	2.04	1444	2.48	16.33

Table 8.45 (cont.)

Frequency distributions of the fifty-six nursing intervention major categories: Multiple, unduplicated categories, and cases

Nursing interventions	RN DXs (multi)		RX DXs (undup.)		Cases
	#	%	#	%	%
Perineal Care	66	0.09	66	0.11	0.75
Personal Care	1210	1.65	1147	1.97	12.98
Physical Health Care	1675	2.28	1465	2.51	16.57
Physician Contact	1996	2.72	1854	3.18	20.97
Professional/Ancillary Service	2414	3.28	1753	3.01	19.83
Psychosocial Analysis	383	0.52	358	0.61	4.05
Radiation Therapy Care	42	0.06	42	0.07	0.48
Respiratory Care	1139	1.55	904	1.55	10.23
Restorative Care	3110	4.23	2887	4.95	32.66
Safety Precautions	2085	2.84	1939	3.33	21.93
Sleep Pattern Control	15	0.02	15	0.03	0.17
Skin Care	964	1.31	954	1.64	10.79
Specimen Collection	2351	3.20	2196	3.77	24.84
Symptom Control	1307	1.78	1307	2.24	14.79
Terminal Care	195	0.27	179	0.31	2.02
Tracheostomy Care	76	0.10	76	0.13	0.86
Vital Signs	2254	3.07	2254	3.87	25.50
Weight Control	631	0.86	631	1.08	7.14
Wound Care	3734	5.08	2690	4.61	30.43

[1/] Includes unknown variables: 898 1.22 898 1.56 10.16

Table 8.46

Frequency distributions of range of one hundred sixty-six nursing intervention major categories: Cases

Range	Number	Percent
1	350	4
2	661	7.5
3	770	8.7
4	733	8.3
5	695	7.9
6	703	8
7	671	7.6
8	582	6.6
9	573	6.5
10	490	5.5
11	480	5.4
12	372	4.2
13	320	3.6
14	275	3.1
15	216	2.4
16	215	2.4
17	157	1.8
18	122	1.4
19	90	1
20	74	0.8
21	56	0.6
22	63	0.7
23	46	0.5
24	29	0.3
25	31	0.4
26	11	0.1
27	6	0.1
28	18	0.2
29	5	0.1
30	8	0.1
31	5	0.1
32	6	0.1
33	4	0
34	1	0
40	1	0
42	1	0

Table 8.47

Frequency distributions of range of fifty-six nursing intervention major categories: Cases

Range	Number	Percent
1	412	4.7
2	789	8.9
3	949	10.7
4	936	10.6
5	878	9.9
6	870	9.8
7	782	8.8
8	733	8.3
9	594	6.7
10	497	5.6
11	375	4.2
12	300	3.4
13	211	2.4
14	175	2
15	124	1.4
16	88	1
17	51	0.6
18	36	0.4
19	20	0.2
20	9	0.1
21	4	0
22	3	0
23	2	0
25	2	0

Table 8.48

Frequency distributions of the twenty-two nursing intervention home health care components: Multiple, unduplicated categories, and cases

Nursing intervention components	RN DXs (multi)		RX DXs (undup.)		Cases
	#	%	#	%	%
Total	73529	100.00	53766	100.00	608.21
Activity	3319	4.57	2392	4.52	27.06
Cardiac Output	4586	6.31	3738	7.07	42.29
Cognitive	676	0.93	676	1.28	7.65
Coping	904	1.24	736	1.39	8.33
Digestive	3936	5.42	2826	5.35	31.97
Fluid	2455	3.38	2062	3.90	23.33
Health Behavior	7486	10.31	4179	7.90	47.27
Injury/Safety	2119	2.92	1960	3.71	22.17
Medication	7706	10.61	5255	9.94	59.45
Metabolic	2809	3.87	1669	3.16	18.88
Nutritional	4685	6.45	4064	7.69	45.97
Physical Regulation	8614	11.86	5126	9.70	57.99
Respiratory	1675	2.31	1200	2.27	13.57
Role Relationship	422	0.58	387	0.73	4.38
Self-Concept	652	0.90	579	1.10	6.55
Self-Care	1210	1.67	1147	2.17	12.98
Sensory	1578	2.17	1506	2.85	17.04
Tissue Perfusion	3506	4.83	2855	5.40	32.30
Tissue/Skin Integrity	4212	5.80	2897	5.48	32.77
Urinary	3196	4.40	1996	3.78	22.58
Wound Care	3734	5.14	2690	5.09	30.43
Skilled Observation	3151	4.34	2928	5.54	33.12

Table 8.49

Frequency distributions of range of twenty-two nursing intervention home health care components: Cases

Range	Number	Percent
1	441	5
2	842	9.5
3	1005	11.4
4	963	10.9
5	1014	11.5
6	924	10.5
7	881	10
8	727	8.2
9	604	6.8
10	468	5.3
11	349	3.9
12	241	2.7
13	172	1.9
14	114	1.3
15	49	0.6
16	26	0.3
17	14	0.2
18	5	0.1
19	1	0

Table 8.50

Frequency distributions of the top fifty medical diagnoses or surgical procedures of cases: Rank order

Rank	#	%	ICD-9 code	Medical dianoses/ surgical procedures
1	490	5.64	428.0	Congestive heart failure
2	328	3.78	436	CVA
3	189	2.18	496	Chr obstr pulmonary
4	127	1.46	486	Pneumonia, organism
5	125	1.44	401.9	Hypertension
6	121	1.39	*15.9	Oth extraoc mus-tend
7	115	1.32	*14.1	Posterior seg diagnos
8	110	1.27	707.0	Decubitus ulcer
9	108	1.24	250.00	Diabetes uncompl non insul dep
10	107	1.23	410.9	Myocardial infarct
11	97	1.12	*61.0	Scrotum & tunica l & d
12	80	0.92	788.3	Incontinence of urine
13	74	0.85	599.0	Urin tract infection
14	72	0.83	162.9	Mal neo bronch/lung
15	69	0.79	*12.2	Anterior segment dx
16	68	0.78	250.90	Diab w compl adult
17	65	0.75	*61.3	Scrotal les destruction
18	65	0.75	*93.5	Oth immobiliz/wound
19	60	0.69	*92.9	Radio therapy
20	56	0.64	*16.9	Other eye & orbit
21	56	0.64	250.01	Diabetes uncompl insul dep
22	56	0.64	707.1	Chronic ulcer of leg
23	54	0.62	428	Heart failure
24	51	0.59	*57.9	Other bladder
25	50	0.58	*41.5	Total splenectomy
26	50	0.58	276.5	Dehydration/hypovolemia
27	49	0.56	*02	Other brain
28	49	0.56	*41.1	Puncture of spleen
29	49	0.56	*61.4	Scrotum & tunica repair
30	47	0.54	*89.3	Other examinations
31	44	0.51	788.2	Retention of urine
32	40	0.46	411.1	Unstable angina
33	40	0.46	427.31	Atrial fibrillation
34	39	0.45	*49.1	Incis/excis anal fistula
35	38	0.44	*62.2	Testicular les destruct
36	38	0.44	250.91	Diab w compl juven
37	36	0.41	427.9	Cardiac dysrhythmia
38	36	0.41	682.6	Cellulitis of leg
39	35	0.4	185	Malign neopl prostate
40	35	0.4	560.39	Impaction intestine

Table 8.50 (cont.)

Frequency distributions of the top fifty medical diagnoses or surgical procedures of cases: Rank order:

Rank	#	%	ICD-9 code	Medical dianoses/ surgical procedures
41	34	0.39	250.0	Diabetes mellitus uncomp
42	34	0.39	435.9	Trans cereb ischemia
43	33	0.38	780.3	Convulsions
44	32	0.37	*54.3	Destruct abd wall lesion
45	31	0.36	*12.4	Destr iris/cil body les
46	31	0.36	281.0	Pernicious anemia
47	30	0.35	*60.4	Retropubic prostatectomy
48	30	0.35	413.9	Angina pectoris
49	30	0.35	466.0	Acute bronchitis
50	30	0.35	578.9	Gastrointest hemorr

* Surgical procedure/operation

Table 8.51

Frequency distributions of the top fifty medical diagnoses or surgical procedures of cases: ICD-9 codes:

Rank	#	%	ICD-9 code	Medical diagnoses/ surgical procedures
1	49	0.56	*02	Other brain
2	69	0.79	*12.2	Anterior segment dx
3	31	0.36	*12.4	Destr iris/cil body les
4	115	1.32	*14.1	Posterior seg diagnos
5	121	1.39	*15.9	Oth extraoc mus-tend
6	56	0.64	*16.9	Other eye & orbit
7	49	0.56	*41.1	Puncture of spleen
8	50	0.58	*41.5	Total splenectomy
9	39	0.45	*49.1	Incis/excis anal fistula
10	32	0.37	*54.3	Destruct abd wall lesion
11	51	0.59	*57.9	Other bladder operations
12	30	0.35	*60.4	Retropubic prostatectomy
13	97	1.12	*61.0	Scrotum & tunica I & d
14	65	0.75	*61.3	Scrotal les destruction
15	49	0.56	*61.4	Scrotum & tunica repair
16	38	0.44	*62.2	Testicular les destruct
17	47	0.54	*89.3	Other examinations
18	60	0.69	*92.9	Radio therapy
19	65	0.75	*93.5	Oth immobiliz/wound
20	72	0.83	162.9	Mal neo bronch/lung
21	35	0.4	185	Malign neopl prostate
22	34	0.39	250.0	Diabetes mellitus uncomp
23	108	1.24	250.00	Diabetes uncompl non insul dep
24	56	0.64	250.01	Diabetes uncompl insul dep
25	68	0.78	250.90	Diab w compl adult
26	38	0.44	250.91	Diab w compl juven
27	50	0.58	276.5	Dehydration/hypovolemia
28	31	0.36	281.0	Pernicious anemia
29	125	1.44	401.9	Hypertension
30	107	1.23	410.9	Myocardial infarct
31	40	0.46	411.1	Unstable angina
32	30	0.35	413.9	Angina pectoris
33	40	0.46	427.31	Atrial fibrillation
34	36	0.41	427.9	Cardiac dysrhythmia
35	54	0.62	428	Heart failure
36	490	5.64	428.0	Congestive heart failure
37	34	0.39	435.9	Trans cereb ischemia
38	328	3.78	436	CVA
39	30	0.35	466.0	Acute bronchitis
40	127	1.46	486	Pneumonia, organism
41	189	2.18	496	Chr obstr pulmonary dis

Table 8.51 (cont.)

Frequency distributions of the top fifty medical diagnoses or surgical procedures of cases: ICD-9 codes:

Rank	#	%	ICD-9 code	Medical dianoses/ surgical procedures
42	35	0.4	560.39	impaction intestine
43	30	0.35	578.9	Gastrointest hemorr
44	74	0.85	599.0	Urin tract infection
45	36	0.41	682.6	Cellulitis of leg
46	110	1.27	707.0	Decubitus ulcer
47	56	0.64	707.1	Chronic ulcer of leg
48	33	0.38	780.3	Convulsions
49	44	0.51	788.2	Retention of urine
50	80	0.92	788.3	Incontinence of urine

* Surgical procedure/operation

Table 8.52

Frequency distributions of home visits per case: Skilled nurses

Visit	Number	Percent	Cum. Freq.	Cum. Percent
1	277	3.2	277	3.2
2	502	5.8	779	9.0
3	656	7.5	1435	16.5
4	714	8.2	2149	24.7
5	683	7.9	2832	32.6
6	689	7.9	3521	40.5
7	615	7.1	4136	47.6
8	536	6.2	4672	53.7
9	447	5.1	5119	58.9
10-14	1217	17.3	6636	76.3
15-19	772	8.8	7408	85.2
20-24	423	4.9	7831	90.1
25-29	265	3.1	8096	93.1
30-34	163	1.8	8259	95.0
35-39	115	1.4	8374	96.3
40-49	136	1.5	8510	97.9
50-59	66	0.7	8576	98.6
60-69	32	0.2	8608	99.9
70 to 179	83	0.2	8691	100.0

Table 8.53

Frequency distributions of home visits per case:
Home health aides

Visit	Number	Percent	Cum. Freq.	Cum. Percent
0	5333	61.3	5333	61.3
1	193	2.2	5526	63.5
2	190	2.2	5716	65.7
3	208	2.4	5924	68.1
4	200	2.3	6124	70.4
5	198	2.3	6322	72.7
6	196	2.3	6518	75.0
7	177	2.0	6695	77.0
8	159	1.8	6854	78.8
9	133	1.5	6987	80.3
10-14	557	6.3	7544	86.8
15-19	350	4.0	7894	90.8
20-24	240	2.9	8134	93.5
25-29	150	1.6	8284	95.3
30-34	97	1.1	8381	96.4
35-39	59	0.5	8440	97.1
40-44	38	0.4	8478	97.5
45-49	43	0.5	8521	98.0
50-59	61	0.7	8582	98.7
60-69	26	0.1	8608	99.0
70-159	83	0.3	8691	100.0

Table 8.54

Frequency distributions of home visits per case: Physical therapists

Visit	Number	Percent	Cum. Freq.	Cum. Percent
0	6828	78.5	6828	78.5
1	191	2.2	7019	80.7
2	182	2.1	7201	82.8
3	164	1.9	7365	84.7
4	159	1.8	7524	86.5
5	120	1.4	7644	87.9
6	130	1.5	7774	89.4
7	114	1.3	7888	90.7
8	112	1.3	8000	92.0
9	83	1.0	8083	93.0
10-14	273	3.2	8356	96.1
15-19	157	1.8	8513	97.9
20-24	94	1.1	8607	99.0
25-29	44	0.5	8651	99.5
30-47	40	0.2	8691	100.0

Table 8.55

Frequency distributions of home visits per case: Medical social worker

Visit	Number	Percent	Cum. Freq.	Cum. Percent
0	7587	87.2	7587	87.2
1	571	6.6	8158	93.8
2	309	3.6	8467	97.4
3	125	1.4	8592	98.8
4	50	0.6	8642	99.4
5	17	0.2	8659	99.6
6	16	0.2	8675	99.8
7	7	0.1	8682	99.8
8	5	0.0	8687	99.9
9	3	0.0	8690	99.9
10	1	0.0	8691	100.0

Table 8.56

Frequency distributions of home visits per case: Occupational therapists

Visit	Number	Percent	Cum. Freq.	Cum. Percent
0	8325	95.7	8325	95.7
1	64	0.7	8389	96.5
2	61	0.7	8450	97.2
3	50	0.6	8500	97.7
4	38	0.4	8538	98.2
5	26	0.3	8564	98.5
6	19	0.2	8583	98.7
7	9	0.1	8592	98.8
8	18	0.2	8610	99.0
9	15	0.2	8625	99.2
10-14	31	0.2	8656	99.5
15-19	16	0.2	8672	99.7
20-31	19	0.0	8691	100.0

Table 8.57

Frequency distributions of home visits per case: Speech therapists

Visit	Number	Percent	Cum. Freq.	Cum. Percent
0	8503	97.8	8503	97.8
1	41	0.5	8544	98.3
2	19	0.2	8563	98.5
3	14	0.2	8577	98.6
4	8	0.1	8585	98.7
5	6	0.1	8591	98.8
6	6	0.1	8597	98.9
7	8	0.1	8605	99.0
8	13	0.1	8618	99.1
9	11	0.1	8629	99.2
10-14	21	0.2	8650	99.5
15-19	15	0.1	8665	99.6
20-44	26	0.0	8691	100.0

Table 8.58

Mean results for all provider types:
Cases

Provider type	Mean	SD
Total	20.60	25.76
Skilled nursing	11.66	14.64
Home health aide	6.06	14.44
Physical therapy	1.87	5.20
Occupational therapy	0.27	1.88
Speech therapy	0.23	2.36
Medical social worker	0.25	0.88

Table 8.59

Mean results for combined provider types:
Cases

Combined provider types	Mean	SD
Skilled nursing	11.66	13.98
Nursing & home health aide	17.36	21.33
Nursing & other providers	14.15	15.13
All providers	19.92	23.32
All providers/ weighted (HHA = .67)	18.17	20.98

Table 8.60

Frequency distributions of days between first and last home visit: All providers

Visit Days	Number	Percent	Cum. Freq.	Cum. Percent
1-5	590	6.7	590	6.8
6-10	703	8.1	1293	14.9
11-15	782	8.9	2075	23.9
16-20	728	8.4	2803	32.2
21-25	790	9.1	3593	41.3
26-30	674	7.8	4267	49.1
31-40	948	10.8	5215	60.0
41-50	839	9.7	6054	69.6
51-60	756	8.5	6810	78.3
61-70	365	4.2	7175	82.5
71-80	217	2.2	7367	84.7
81-90	181	2.0	7573	87.1
91-100	156	1.6	7729	88.9
101-110	135	1.5	7864	90.4
111-120	145	1.8	8009	92.1
121-130	106	1.3	8115	93.3
131-140	55	0.6	8170	94.0
141-150	61	0.6	8231	94.7
151-160	35	0.3	8266	95.1
161-170	42	0.4	8308	95.5
171-180	31	0.2	8339	95.9
181-190	31	0.3	8370	96.3
191-200	17	0.0	8387	96.5
201-250	98	0.2	8485	97.6
251-300	45	0.1	8530	98.1
301-400	106	0.1	8636	99.3
401-500	24	0.0	8659	99.6
501-3310	32	0.0	8691	100.00

Table 8.61

Frequency distributions by length of episodes for all providers: Cases

Visit Days	Number	Percent	Cum. Number	Cum. Percent
Total	8,691	100.0	-	-
1 - 30	4,267	49.1	4,267	49.1
31 - 60	2,543	29.2	6,810	78.3
61 - 90	763	8.3	7,573	87.1
91 - 120	436	5.0	8,009	92.1
121 - 365	589	6.8	8,598	98.9
over 365	91	1.6	8,691	100.0

Table 8.62

Frequency distributions of three cohort classes for all providers: Cases

Cohorts	Number	Percent	Cum. Number	Cum. Percent
Total	8,691	100.0	-	-
under 30 days	4,267	49.1	4,267	49.1
31 - 120 days	3,742	42.5	8,009	91.6
over 120 days	682	8.4	8,691	100.0

Figure 8.1

Five functional status scales: Activities of daily living

GU ADL (9 levels) Score 9-27

- Bathing
- Dressing
- Toileting
- Transfer
- Continence (bowel/bladder control)
- Feeding (eating)
- Walking (mobility)
- Telephone (using)
- Medications (managing)

RUGS (4 levels) Score 3-10

- Toileting (1-3)
- Eating (1-4)
- Tube/Parental Feeding (1)
- Transfer (1-3)

Katz ADL Index (6 levels) Score 0-6

- Bathing
- Dressing
- Toileting
- Transfer
- Continence
- Feeding

Katz ADL Index Home Care (7 levels) Score 0-7

- Bathing
- Dressing
- Toileting
- Walking/mobility
- Transfer
- Continence
- Feeding

IADL Scale (2 levels) Score 0-6

- Telephone (using)
- Medications (managing)

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9. PREDICTIVE FINDINGS

Overview

This section presents the findings for the categorical and regression models that were tested to develop a method for classifying home health Medicare patients. To accomplish this goal data on the actual resources used were measures of resource requirements. Since there is no agreement on which specific variables were valid predictors of resource use, data were collected on a large volume of cases and tested to explore the statistical significance of different models.

Five major types of classification variables (independent variables) along with two subcategories were considered to be major predictors of resource requirements: (a) demographics, (b) functional status, (c) nursing diagnoses, (d) nursing interventions, and (e) medical diagnosis. The two subcategories are: (a) discharge statuses of nursing diagnoses, (b) types of nursing interventions

Four variables were selected as measures of resource use (dependent variables): (a) nursing visits for first thirty days of episode (NVRN30), (b) weighted visits for first thirty days of episode (NVWT30), (c) nursing visits for total episode (NVWTALL), and (d) weighted visits for total episode (NVWTALL).

These variables were analyzed using regression and categorical models which are described and presented in tables and graphs. A summary of these analyses are shown in Table 9.1, where the overall R-squares for these models are compared and the percent of variance explained by the classification (independent variables) for the different measures of resources used (dependent variables).

The most significant findings are that the nursing diagnosis and nursing intervention home health care components were the best predictors of the number of nursing visits and all provider visits for the first thirty (30) days and the total episodes of care. On the other hand, demographics and functional status (ADLs) were the poorest predictors. The primary medical diagnosis or surgical procedure possessed marginal predictability for only the nursing visits for the first thirty (30) days of the episode.

Another significant finding emerged from a cohort model which classified the length of the episodes of care into three time periods for three different clusters of cases: (a) short term case (under 30 days), (b) intermediate case (30 to 120 days) and (c) long term case (120 to 365 days). Because of the way the data were collected it was not possible to predict resource requirements for each time period separately or to predict membership in each of the classes on admission to home health care. It was however, determined that the short term cases (under 30 days) comprised a different class of patient from those over thirty (30) days. Approximately fifty percent of the cases were less than thirty (30) days duration when resource use is the heaviest. The length of an episode of care was analyzed in the models in terms of the number of visits under thirty days (NVRN30) as well as the number of visits for the total episode (NVWTALL).

The linear regression and categorical regression models that were tested are now described in detail.

Demographic Regression Models

The four demographic regression models tested the ability of ten commonly used demographic variables to predict each of the four dependent variables (NVRN30, NVWT30, NVRNALL, and NVWTALL) which measured resource use. The detailed results of the four demographic regression models are presented in Table 9.2, along with an illustrated graph in Figure 9.1 which compared the regression coefficients for each of the independent demographic variables. It included the intercept term used to write a regression equation which can be used to predict the number of visits for a single case. The overall means for the entire sample for each dependent variable (7.51, 11.03, 11.51, and 17.93) were also included as a frame of reference to evaluate the magnitude of the regression coefficients.

Although each of the four regression models were statistically significant for the overall regression, the R-square for each model were relatively low (.015 .006 .008 .009) indicating that even using ten different demographic variables in each model explained only about one percent of the case to case variation in resource requirements. The large number of cases in the sample probably helped to achieve overall statistical significance even when the effects of the demographic variables are small. There was little difference between the ability to predict resource requirements in the first thirty days (NVRN30 and NVWT30) which was slightly higher when R-squares are compared with the models which predicted resource requirements in the total episode (NVRNALL and NVWTALL). There also were no consistent differences in the ability to predict nursing visits (NVRN30 and NVRNALL) compared with the ability to predict weighted total visits for all provider types (NVWT30 and NVWTALL).

Only half of the demographic variables used in each model had regression coefficients which were significantly different from zero either because the effects of the other variables were small or because the case to case variability was too great (ie. poor correlation with the dependent variable or measure of resource use). **Age** was consistently significant, but showed only a very small decrease in mean visits with increasing age, presumably because older patients were less likely to remain in home care. Likewise **male** sex showed a significant, but small decrease in mean visits in the models for the total episode which was not statistically significant in the first thirty (30) days.

It appeared that **pets in residence** was the variable with the strongest relationship to home health care. When pets were present, nursing visits were increased by two per case. **Self-care** (ie. non-availab[redacted] in the [redacted] days (NVRN30 and [redacted] a mean of 7.5 and [redacted] (NVRNALL and NVWTALL). **Comprehends** and **married** also contributed to increased resource use in several of the models.

The two variables that were always considered to affect whether services could be provided in the home setting, **living arrangements** and **available primary caregiver**, did not present significant findings in most of the models. **Ethnicity** and **housing** were also not significant.

These regression models showed that demographic variables when used alone did not predict home care resource requirements. Nonetheless, several of these demographic variables are related to resource requirements which is why they were chosen for inclusion in combined models which use demographic variables to refine and improve predictions for factors as nursing diagnoses or nursing interventions.

Functional Status Categorical Models

Two different scales that measured activities of daily living (ADL), RUGs ADL Index and Georgetown (GU) ADL, were explored as predictors of resource requirements using categorical regression models because each case is scored into a single category or level of ADL score.

Functional Status: RUGs ADL

The results for the four regression models based on the RUGs ADL Index measured on admission are presented in Table 9.3, and the data for the more detailed GU ADL are presented in Table 9.4 and discussed in the section below. Both sets of

categorical models (ie. analysis of variance using the general linear models method) use the same four dependent variables – two for the first thirty days (NVRN30 and NVWT30) and two for the total episode (NVRNALL and NVWTALL) as the other sets of models presented in this section.

The RUGs ADL scores ranged from 3 to 10 giving each model eight categories into which the cases were sorted. Table 9.4 includes the number of cases in each ADL category and the mean and standard deviation of each of the four dependent variables. The difference in N for the two models describing the first thirty (30) days and the total episode was due to missing data for visit dates which prevented calculating visits during the first thirty (30) days for a few cases where the total episode was greater than the first thirty (30) days and the total number of visits was known but could not be accurately split between the first thirty (30) days and the rest of the case.

While the number of visits tended to increase with increasing RUGs ADL score, the effect was much less dramatic and consistent than was expected. There was also a difference between the dependent variables which measured nursing visits and the dependent variables measuring weighted total provider visits. Also, unlike most of the other models, predictions were more accurate for the total episode than for the first thirty (30) days.

The R-squares for nursing visits were very low, .003 and .002, while the R-squares for weighted all provider visits, .030 and .037, were higher and yet explained only 3 to 4 percent of the case to case variation in visits. While this variable was a little better than demographics alone, it was still one of the poorest prediction models examined and the prediction for nursing alone is completely useless. The graph which followed (Figure 9.2) clearly showed that the relationship between higher RUGs ADL score and higher total provider visits did not extend to include higher numbers of nursing visits for cases with higher RUGs ADL scores.

ADL scales measure dependency and have been used very successfully in long term care settings, but they clearly did not measure the key factors predicting home health care nursing visits. They were probably more highly related to home health aide visits than nursing visits, and therefore using ADL is not recommended as a method for classifying home care patients. Many of the ADL items have more precise equivalent terms in the nursing diagnosis and nursing intervention home health care components, which are more meaningful measures of the patient's need for home health care nursing visits than ADL scores.

Functional Status: GU ADL

The Georgetown GU ADL score included 9 items, including two IADLs, and ranged from 9 to 27 providing 19 categories for classification rather than the 8 used by RUGs ADL scale. The results of the four categorical models for the GU ADL measured on admission are presented in Table 9.4. They showed only a slight improvement over RUGs ADL, and were completely consistent with the findings for RUGs ADL.

The same dramatic contrast in R-square for nursing visits, .004 and .003, compared with all provider visits, .039 and .042 is illustrated in Figure 9.3. The graph helped to demonstrate the lack of smooth consistent increase in number of visits with higher ADL score. As with RUGs ADL, the predictions for the total episode were slightly better than those for the first thirty (30) days. Improving the precision of the ADL scale did not change the basic finding that ADL is not very useful for classifying nursing cases.

Nursing Diagnosis Components Regression Models

The four regression models developed for nursing diagnoses were based on the twenty (20) nursing diagnosis home health care (HHC) components which summarized the care requirements of each case. These models based on twenty (20) nursing diagnoses components were much more manageable than earlier efforts based on a more detailed list of one hundred forty-seven (147) nursing diagnoses or forty-two nursing diagnoses major categories. These lists had too many categories for effective regression analysis and also may have suffered from inconsistent use of multiple codes within the same category.

However, the regression models based on twenty (20) nursing diagnoses components were more effective than the list of nine human response patterns or list of eleven functional health patterns of nursing diagnoses which were abandoned for purposes of regression modeling. Because each case may have multiple nursing diagnosis components, each component was treated as a dummy variable in the regression models and had its own regression coefficients. The coefficient for each component compares the number of visits for cases which include that component with number of visits for a case which lack that component, adjusting for the effects of other coexisting components.

As shown in Table 9.5, the overall R-squares showed twice the predictive power of the best functional status (ADL) models, with all four models in the 6 to 7 percent range. Predictions in the first thirty (30) days (Figure 9.4) were better than for the total episode (.067 and .069 versus .061 and .068). Predictions for weighted all provider visits were slightly better than for nursing visits alone, but all four models behaved in a similar fashion unlike the discrepancies seen for the ADL models.

Approximately half of the individual components had statistically significant coefficients and the relative magnitudes were similar in all models. The nutritional nursing diagnosis component tended to decrease the number of visits, while tissue integrity, metabolic, and physical regulation components increased the number of visits. The size of the coefficients in different models varied due to the variation in overall mean number of visits and it was not unusual for a single nursing diagnosis component to increase total visits predicted by over 30 percent of the mean visits (for example, metabolic had a coefficient of 6.60 with an overall mean of 17.945 in the total episode for all provider visits model).

The twenty (20) nursing diagnosis HHC components are clearly an effective tool for predicting home health visits by nurses as well as all provider visits and had greater predictive power than ADLs alone.

Number of Nursing Diagnosis Components Categorical Models

The number of nursing diagnosis components per case were used to construct simple categorical models using the count of nursing diagnosis components for cases as a crude index of the complexity of the cases, ignoring the important differences already demonstrated above between the different components. This simplistic model was not a good predictor of home visits. Like the functional status ADL models, it was better for the total episode than for the first thirty (30) days and did better for all providers than for nursing visits alone.

It is noteworthy that the individual component means in Tables 9.6 and 9.7 showed consistent increases in mean visits with increasing numbers of nursing diagnosis components. The concept that a case with more nursing diagnosis components needs more visits was adequately proven by these models; however, models based on the specific individual nursing diagnosis components were much more accurate predictors of the number of visits for each case.

Discharge Status Pattern Categorical Models

Discharge status alone, ignoring the specific nursing diagnosis components, was examined using a categorical model (ANOVA) based on the combinations of statuses found in each case. Cases were thus categorized as all nursing diagnoses improved, deteriorated, or various combinations of improved, stabilized, and deteriorated.

The R-squares from these models were very low, and as seen in Table 9.8 There was no clear pattern or trend in mean visits within or between models. While discharge status contributes information to specific nursing diagnosis components, it has little or no usefulness on its own.

Nursing Diagnosis Components by Discharge Status Regression Models

Each of the twenty (20) nursing diagnosis components was also coded into three levels of discharge status (improved, no change, deteriorated) which could be interpreted as treatment goals or expected outcomes for the case. This permitted construction of more complex regression models based on sixty (60) nursing diagnosis components rather than twenty (20). Increasing the complexity of the model produced consistent and noticeable improvement in all models as reflected by the increase in R-squares (.061 to .073, .068 to .081, .067 to .079, and .069 to .094). The first thirty (30) days all provider visits R-square of .094 was three times as effective as the comparable RUGs ADL model with an R-square of .03.

The individual regression coefficients shown in Tables 9.9, 9.10, 9.11, and 9.12 contained many statistically significant findings with most of the larger positive or negative coefficients for cases which showed a poor outcome (discharge status = 3) reflecting that much of home health care was not directed at cure, rehabilitation, or stabilization, but was concerned with coping with deteriorating conditions.

While it is a little more difficult to code cases on two dimensions of nursing diagnosis (component and treatment goal or expected outcome), the improvement in the accuracy of prediction may be worth the effort in some situations.

Nursing Intervention Components Regression Models

The nursing intervention components regression models as shown in Table 9.13 were similar to the nursing diagnoses models and were based on twenty-two (22) home health care (HHC) components, each component was used as a dummy regression variable. The nursing intervention components models, illustrated in Figure 9.5, were even more effective than the nursing diagnoses models at predicting visits. Like the nursing diagnoses components, the nursing intervention components did better in the first thirty (30) days than the total episode (.105 and .061 versus. .085 and .062). Nursing intervention components alone were better predictors of nursing visits than total provider visits (.105 and .085 versus .061 and .062) which contrasted with nursing diagnosis components where all provider visits predictions were slightly better. The coding of nursing interventions was probably more consistent in this retrospective study, which may account for some of the differences.

The individual components showed similar results in all four models with wound care and metabolic component care leading all four lists with large coefficients which reflected increased need for care. Role relationship consistently was related to decreased

visits and several other components such as fluid volume, urinary elimination, and tissue integrity all had positive effects on visits. Nursing intervention components are thus another very effective method for predicting home care visits.

Number of Nursing Interventions Components Categorical Models

A similar simple index based on number of nursing intervention components per case was also tested with a set of categorical models and yielded the same results as the number of nursing diagnosis component models (Tables 9.14 and 9.15). In all cases, more nursing intervention components increased the mean number of visits. However, typically, only two percent of the variance was explained by the model.

Type of Nursing Intervention Patterns Regression Models

As was done previously for discharge status, type of nursing intervention was combined into patterns to create a categorical model which compared cases such as assess only or care only, to more complex cases with Assess, Care, Manage, and Teach in the same case.

The R-squares were a little stronger than for discharge status, but basically in the three to four percent range which was similar to RUGs ADL or GU ADL. Table 9.16 showed no clear pattern in mean visits by pattern though there was a small trend for cases with more types to have more visits. The more complex patterns were seen only in cases with many nursing interventions. It was concluded that this type of model has little usefulness. It reinforced the strengths of other models and revealed that this simplistic model works about as well as RUGs ADL or GU ADL.

Nursing Intervention Components by Four Types of Intervention Regression Models

The best regression models developed in this study were found with the refinement of the nursing intervention component models into the four types of nursing interventions: (a) Assess, (b) Care, (c) Manage, (d) Teach. These complex models had 88 dummy variables (22 components broken into 4 types) and yielded an R-square as high as .15 which was over four times higher as the baseline RUGs ADL or GU ADL, or the medical diagnosis models. As in the twenty-two (22) nursing intervention component models, the effects of nursing intervention components were greater in the first thirty (30) days than the total episode and greater for nursing visits than all provider visits.

The individual regression coefficients in Tables 9.17, 9.18, 9.19, and 9.20, include many significant findings. Of particular note was the importance of nursing intervention type three which deals with manage patient care. For some nursing intervention

components, manage care led to highly positive coefficients reflecting an increase in visits, while in other components, manage was associated with a highly negative coefficient or a decrease in visits.

The large number of independent variables made these regression models unwieldy and precluded combinations of these models with other models such as demographics. Perhaps it will be possible in the future to combine several of these 88 categories into clusters with similar behavior so as to reduce the combined nursing intervention and type nursing interval model to a more manageable size. The strength of these predictions clearly shows that nursing intervention components (which follow the nursing diagnosis components) are the best predictors of number of visits for a home health care case.

Medical Diagnosis Categorical Models

The twenty (20) primary medical diagnosis or surgical procedure groups based on the main headings of the ICD-9-CM were used to construct categorical models since each case has only one primary condition with the surgical condition given priority over a medical condition if both were entered for a case.

As shown by the R-squares, medical diagnosis was a much weaker predictor of visits than nursing diagnosis and performed slightly better than the best ADL models. Predictions were best for the first thirty (30) days (.054 and .037 versus .032 and .022) and were better for nursing visits than total provider visits (.054 and .032 versus .037 and .022).

As shown in Table 9.21 and illustrated in Figure 9.6, the mean number of visits for each medical diagnosis followed similar patterns in all four models. The highest mean percentages were for the three most frequent conditions: **operations of integumentary system, skin conditions,** and **operations of the musculoskeletal system.** The values for surgical cases were generally higher than for the medical cases.

The use of a single medical category per case limited its predictive power compared to the nursing diagnosis or intervention components which more completely describes the number of visits for the case and reflected important differences between cases in the same medical category with very different nursing care visits.

Nursing Diagnosis Components and Demographics Regression Models

The twenty (20) nursing diagnosis HHC components were combined with the ten demographic variables to develop a stronger regression model by refining the nursing diagnosis components prediction with the additional information given by the

demographics. These models showed an increase of about one percent in the accuracy of the predictions as reflected by the R-squares when the R-squares of the nursing diagnosis models were compared to the combined models (ie. NVRN total episode .066 versus .061). The patterns between the four models remained similar with better predictions in the first thirty (30) days than total episode and better predictions for nursing visits than total provider visits.

The individual regression coefficients shown in Tables 9.22 and 9.23, indicated that the nursing diagnosis components have a stronger effect on visits than individual demographic variables. The results in the combined models were similar to the finding for demographics or nursing diagnosis alone. When these two sets of independent variables were considered as possible predictors of resource requirements the three significant nursing diagnosis components still remained as having the highest coefficients and the most significant p values for the four dependent variables.

Combining variables from different sets of regression models did improve the performance of the overall model, but it is of note that using nursing intervention components instead of nursing diagnosis components had a greater effect than combining nursing diagnosis component with demographics.

Nursing Intervention Components and Demographics Regression Models

The impact of adding demographic variables to the successful nursing intervention components models showed even less improvement in R-squares than was seen when demographics were added to nursing diagnosis. The changes were small (.083 to .089, .062. 066, .105 to .114, .062 to 064), though the best model, nursing visits for first 30 days, had an impressive 11.35 percent variance explained.

As seen before for nursing diagnosis components and demographics, Tables 9.24, 9.25, 9.26, and 9.27 again showed the nursing intervention components to be similar to the original model; the demographic variables had little effect compared to the intervention components.

Nursing Diagnosis and Nursing Intervention Components Regression Models

Combining the twenty (20) nursing diagnosis components with the twenty-two (22) nursing intervention components produced a set of regression models with very good R-squares (.102 .096 .121 .099) with the same pattern seen previously for nursing intervention components: better in first thirty (30) days than total episode, better for nursing visits than all providers. Tables 9.28 and 9.29 showed that the effects of the nursing intervention

components were generally greater than the nursing diagnosis components, though both were important. The limitations of the retrospectively coded data used in this analysis preclude strong statements about the differences between nursing diagnosis and intervention components.

In a prospective study, the agreement in coding should be highly reliable and the behavior of the individual nursing diagnosis or intervention components models and the combined models should be more alike than was found in this study. With improvements in the original coding of nursing diagnosis and intervention components, there should be less need for combined models in the future and the nursing diagnosis component models should be as effective as the nursing intervention component models.

Nursing Diagnosis and Intervention Components, and Demographics Regression Model

The final set of regression models which was tested combined all three of the best models into a single large model using nursing diagnosis, nursing intervention components, and demographics. The improvements in R-squares over the nursing diagnosis and intervention component models were small and more importantly, these combination models were not as good as the nursing intervention components by type model which remained the best predictor of visits as judged by the R-squares.

Tables 9.30, 9.31, 9.32, and 9.33 presented the individual regression coefficients for each independent variable from all three sets. The results remained consistent with the individual models and confirmed the strength of the individual variables. In general, nursing intervention components were better predictors than the nursing diagnosis components. Self-care and pets in home remain important demographic variables which did add to the amount of variance explained by nursing diagnoses and interventions. Most of the coefficients were not statistically significant and could not be considered greater than or smaller than zero.

This large combined model was run primarily to explore the data and not with the intention of using it to classify cases and predict visits in the real world. It demonstrates the value of selecting a strong set of independent variables and the benefits of combining a few selected demographic items with an appropriate set of nursing diagnosis and intervention components of home health nursing care.

Table 9.1

Comparison of R-square results of regression and categorical models by first thirty days and total episode: Classification variables

Regression/Categorical Models	First thirty days		Total Episode	
	Nursing visits	All provider visits	Nursing visits	All provider visits
Demographics	.0154	.0060	.0080	.0089
Functional status/RUGS ADL	.0029	.0304	.0022	.0368
Functional status/GU ADL	.0040	.0391	.0028	.0422
Nursing diagnosis components	.0672	.0692	.0606	.0677
Nursing diagnosis number	.0087	.0288	.0193	.0380
Nursing diagnosis/discharge status patterns	.0145	.0211	.0188	.0220
Nursing diagnosis discharge status	.0786	.0936	.0729	[illegible]
Nursing interventions components	.1046	.0612	.0847	.0620
Nursing intervention number	.0196	.0233	.0206	.0226
Nursing intervention/types of intervention patterns	.0388	.0272	.0380	.0299
Nursing intervention/types	.1464	.0807	.1434	[illegible]
Medical diagnosis or surgical procedure groups	.0535	.0370	.0322	[illegible]
Nursing diagnosis components/ demographics	.0801	.0740	.0664	.0725
Nursing intervention components/ demographics	.1135	.0644	.0891	.0662
Nursing diagnosis/nursing intervention components	.1206	.0992	.1016	.0963
Nursing diagnosis/nursing intervention component/ demographics	.1298	.1028	.1059	.0996

Table 9.2
Regression results as predictors of nursing and all provider visits, by first thirty days and total episode: Demographic variables

First thirty days of episode

Nursing visits				All provider visits			
Rank	Variable	Coefficient	P Value	Rank	Variable	Coefficient	P Value
1	Pets in Home	0.85	0.00	1	Pets in home	0.86	0.00
2	Self-care	0.83	0.00	2	Married	0.68	0.00
3	Comprehends	0.61	0.00	3	Comprehends	0.51	0.02
4	Married	0.42	0.01	4	Self-care	0.10	0.67
5	Lives alone	-0.02	0.90	5	House	0.06	0.76
6	Age	-0.04	0.00	6	Age	-0.03	0.00
7	White	-0.07	0.65	7	Communicate	-0.08	0.75
8	Male	-0.10	0.45	8	Lives alone	-0.19	0.46
9	House	-0.13	0.35	9	White	-0.47	0.03
10	Communicates	-0.91	0.00	10	Male	-0.59	0.00
R^2		0.015		R^2		0.006	
mean		7.51		mean		11.03	
intercept		10.88		intercept		12.83	

Total episode

Nursing visits				All provider visits			
Rank	Variable	Coefficient	P Value	Rank	Variable	Coefficient	P Value
1	Pets in home	2.06	0.00	1	Pets in home	2.43	0.00
2	Comprehends	0.99	0.01	2	Comprehends	1.33	0.01
3	Self-care	0.86	0.03	3	Married	1.30	0.02
4	Married	0.53	0.14	4	House	1.26	0.01
5	House	0.47	0.15	5	Communicate	0.94	0.14
6	Lives alone	0.12	0.78	6	Age	-0.07	0.00
7	White	0.06	0.87	7	Self-care	-0.32	0.59
8	Age	-0.08	0.00	8	White	-0.39	0.47
9	Male	-0.14	0.65	9	Lives alone	-0.39	0.54
10	Communicates	-1.02	0.01	10	Male	-1.14	0.02
R^2		0.008		R^2		0.009	
mean		11.51		mean		17.93	
intercept		16.52		intercept		19.58	

Table 9.3
Mean nursing and provider visits, by first thirty days and total episode: RUGS activities of daily living

First thirty days of episode

Nursing visits				All provider visits			
RUGS ADL scores	N	Mean	SD	RUGS ADL scores	N	Mean	SD
3	2876	7.90	6.04	3	2876	9.39	6.87
4	1281	7.44	6.25	4	1281	10.56	7.76
5	2039	7.38	5.44	5	2039	12.23	8.24
6	958	7.05	4.65	6	958	11.49	8.16
7	374	7.41	4.90	7	374	13.74	9.17
8	316	7.53	6.14	8	316	13.30	10.00
9	481	7.04	5.20	9	481	12.43	9.78
10	63	7.90	4.77	10	63	11.25	7.80
R^2		0.003		R^2		0.030	
mean		7.521		mean		11.027	
n		8388		n		8388	

Total episode

Nursing visits				All provider visits			
RUGS ADL scores	N	Mean	SD	RUGS ADL scores	N	Mean	SD
3	2877	11.38	13.03	3	2877	13.81	15.24
4	1282	10.84	13.43	4	1282	15.81	16.73
5	2039	11.57	12.97	5	2039	20.16	20.50
6	959	11.42	13.14	6	959	20.12	22.85
7	374	12.65	13.53	7	374	24.35	23.82
8	316	13.43	14.66	8	316	26.08	26.67
9	481	11.77	12.10	9	481	23.44	27.01
10	63	15.30	13.77	10	63	24.33	27.21
R^2		0.002		R^2		0.037	
mean		11.535		mean		17.942	
n		8391		n		8391	

Table 9.4
Mean nursing and all provider visits, by first thirty days and total episode:
GU activities of daily living (ADL)

First thirty days of episode

GU ADL scores	Nursing visits N	Nursing visits Mean	Nursing visits SD	GU ADL scores	All provider visits N	All provider visits Mean	All provider visits SD
9	582	7.95	6.34	9	582	8.44	6.63
10	665	7.92	6.53	10	665	8.72	6.86
11	679	7.84	6.39	11	679	9.36	7.13
12	660	7.43	5.78	12	660	9.74	6.84
13	684	7.66	5.78	13	684	11.13	7.62
14	745	7.25	5.16	14	745	11.60	7.31
15	698	7.95	5.78	15	698	12.75	8.45
16	497	7.79	6.17	16	497	12.19	8.50
17	375	7.40	5.31	17	375	11.76	8.15
18	327	7.10	4.58	18	327	11.27	8.00
19	223	6.89	4.46	19	223	11.63	8.13
20	169	7.64	5.26	20	169	12.44	8.70
21	143	8.08	6.05	21	143	14.24	10.34
22	133	7.36	4.41	22	133	12.68	8.87
23	120	8.19	6.85	23	120	14.92	11.28
24	118	7.50	4.24	24	118	13.05	8.16
25	109	6.47	3.95	25	109	12.65	9.17
26	123	7.01	5.63	26	123	12.26	9.71
27	405	7.03	5.26	27	405	11.99	9.68
R^2		0.004		R^2		0.039	
mean		7.58		mean		11.038	
n		7455		n		7455	

Total episode

GU ADL scores	Nursing visits N	Nursing visits MEAN	Nursing visits SD	GU ADL scores	All provider visits N	All provider visits MEAN	All provider visits SD
9	583	10.96	12.07	9	583	11.95	13.39
10	665	11.27	13.15	10	665	12.72	15.35
11	679	11.48	15.94	11	679	13.72	17.18
12	660	11.01	13.41	12	660	14.57	15.67
13	684	11.45	13.44	13	684	17.00	17.54
14	746	10.93	12.10	14	746	17.97	17.15
15	698	12.07	12.61	15	698	20.27	19.38
16	498	12.40	12.59	16	498	20.62	19.72
17	375	12.01	14.30	17	375	20.51	23.96
18	327	11.33	11.20	18	327	19.09	20.71
19	223	10.99	11.07	19	223	20.19	22.41
20	169	12.67	11.41	20	169	22.15	21.08
21	143	13.06	12.50	21	143	25.37	24.97
22	133	11.92	10.75	22	133	21.57	20.34
23	120	13.69	16.17	23	120	28.08	30.01
24	118	14.09	13.37	24	118	27.09	26.31
25	109	11.05	12.20	25	109	23.30	24.76
26	123	12.17	11.03	26	123	22.80	22.91
27	405	12.13	13.00	27	405	23.61	28.12
R^2		0.003		R^2		0.042	
mean		11.626		mean		17.962	
n		7458		n		7458	

Table 9.5
Regression results as predictors of nursing and all provider visits, by first thirty days and total episode: Nursing diagnosis home health care components

First thirty days of episode

Nursing visits				All provider visits			
Rank	Variable	Coefficient	P value	Rank	Variable	Coefficient	P value
1	Tissue integrity	2.69	0.00	1	Tissue integrity	2.72	0.00
2	Physical regulation	1.25	0.00	2	Self-care	2.13	0.00
3	Metabolic	1.20	0.00	3	Role relationship	1.81	0.00
4	Coping	0.46	0.07	4	Activity	1.59	0.00
5	Fluid volume	0.44	0.02	5	Metabolic	1.44	0.00
6	Cognitive	0.44	0.00	6	Physical regulation	0.98	0.00
7	Self-concept	0.39	0.16	7	Cognitive	0.66	0.00
8	Health behavior	0.32	0.08	8	Health behavior	0.65	0.01
9	Medication	0.25	0.36	9	Coping	0.57	0.11
10	Digestive	0.21	0.15	10	Sensory	0.43	0.05
11	Tissue perfusion	0.08	0.60	11	Fluid volume	0.29	0.28
12	Respiratory	0.07	0.62	12	Medication	0.24	0.53
13	Sensory	0.07	0.67	13	Tissue perfusion	0.20	0.36
14	Cardiac output	0.02	0.88	14	Digestive	0.15	0.48
15	Self-care	-0.11	0.45	15	Urinary elimination	0.04	0.87
16	Role relationship	-0.20	0.51	16	Self-concept	-0.05	0.91
17	Nutritional	-0.36	0.03	17	Cardiac output	-0.18	0.35
18	Injury/safety	-0.43	0.04	18	Respiratory	-0.40	0.05
19	Urinary elimination	-0.50	0.00	19	Injury/safety	-0.51	0.08
20	Activity	-0.64	0.00	20	Nutritional	-0.92	0.00
R^2		0.067		R^2		0.069	
mean		7.519		mean		11.032	
intercept		6.307		intercept		8.255	

Total episode

Nursing visits				All provider visits			
Rank	Variable	Coefficient	P value	Rank	Variable	Coefficient	P value
1	Tissue integrity	5.20	0.00	1	Metabolic	6.60	0.00
2	Metabolic	4.25	0.00	2	Tissue integrity	5.63	0.00
3	Physical regulation	3.01	0.00	3	Self-care	4.63	0.00
4	Tissue perfusion	1.08	0.00	4	Role relationship	3.80	0.00
5	Coping	1.06	0.07	5	Physical regulation	3.61	0.00
6	Medication	1.00	0.11	6	Urinary elimination	2.81	0.00
7	Sensory	0.96	0.01	7	Activity	2.78	0.00
8	Fluid volume	0.86	0.05	8	Tissue perfusion	2.05	0.00
9	Urinary elimination	0.81	0.09	9	Medication	1.90	0.05
10	Health behavior	0.52	0.22	10	Sensory	1.61	0.00
11	Digestive	0.49	0.15	11	Coping	1.17	0.19
12	Self-concept	0.46	0.48	12	Health behavior	0.69	0.29
13	Cardiac output	0.41	0.20	13	Digestive	0.68	0.19
14	Cognitive	0.35	0.21	14	Cognitive	0.58	0.17
15	Respiratory	0.24	0.47	15	Fluid volume	0.35	0.60
16	Self-care	0.12	0.71	16	Cardiac output	0.22	0.64
17	Injury/safety	-0.39	0.42	17	Respiratory	-0.34	0.51
18	Nutritional	-0.40	0.29	18	Injury/safety	-0.51	0.48
19	Role relationship	-0.44	0.53	19	Self-concept	-0.67	0.50
20	Activity	-0.73	0.01	20	Nutritional	-1.27	0.03
R^2		0.060		R^2		0.068	
mean		11.525		mean		17.947	
intercept		8.015		intercept		10.795	

Table 9.6

Mean results of nursing and all provider visits, by first thirty days: Number of nursing diagnosis (RN Dx) home health care components

Nursing visits				All provider visits			
RN Dx		Mean	SD	RN Dx		Mean	SD
0	131	6.75	4.77	0	131	9.94	7.54
1	945	7.08	6.12	1	945	9.13	7.30
2	1654	7.18	5.74	2	1654	9.88	7.51
3	1740	7.41	5.95	3	1740	10.72	7.84
4	1464	7.21	5.03	4	1464	10.99	7.88
5	1002	7.95	5.24	5	1002	12.03	7.87
6	659	7.78	5.17	6	659	12.20	8.28
7	416	8.34	6.40	7	416	13.46	9.33
8	252	9.01	5.84	8	252	13.64	8.67
9	155	9.10	7.54	9	155	14.63	10.40
10	68	8.62	4.51	10	68	14.19	9.30
11	32	9.22	5.77	11	32	13.59	9.97
12	20	7.60	3.72	12	20	13.42	8.42
13	10	10.00	6.41	13	10	18.29	7.62
14	3	13.00	7.00	14	3	22.82	5.85
R^2		0.009		R^2		0.028	
mean		7.52		mean		11.03	
n		8551		n		8551	

Table 9.7

Mean results of nursing and all provider visits, by total episode: Number of nursing diagnosis (RN Dx) home health care components

Nursing visits				All provider visits			
RN Dx		Mean	SD	RN Dx		Mean	SD
0	131	9.22	9.51	0	131	15.05	17.50
1	945	9.83	11.97	1	945	13.12	15.18
2	1655	10.09	11.62	2	1655	14.61	15.90
3	1741	11.22	13.73	3	1741	17.08	19.26
4	1464	10.88	11.03	4	1464	17.99	19.49
5	1002	12.91	15.23	5	1002	20.59	22.49
6	659	12.33	12.66	6	659	20.03	19.67
7	417	14.43	14.24	7	417	25.18	26.47
8	252	14.77	13.25	8	252	22.90	19.30
9	155	18.75	20.49	9	155	31.36	30.03
10	68	15.68	13.37	10	68	26.47	24.30
11	32	19.88	18.99	11	32	31.35	30.34
12	20	17.05	16.36	12	20	38.30	41.51
13	10	12.40	8.60	13	10	27.47	17.35
14	3	17.00	11.53	14	3	28.83	11.21
R^2		0.019		R^2		0.038	
mean		11.53		mean		17.95	
n		8554		n		8554	

Table 9.8

Mean results of nursing and all provider visits, by first thirty days and and total episode: Nursing diagnosis discharge status patterns*

First thirty days

Nursing visits				All provider visits			
RN Dx Disch Status Pattern	N	Mean	SD	RN Disch Status Pattern	N	Mean	SD
Imp	3069	7.74	5.93	Imp	3069	11.47	8.22
Imp/Stb	2658	7.73	5.64	Imp/Stb	2658	11.50	8.08
Imp/Stb/Det	540	8.54	5.95	Imp/Stb/Det	540	12.57	8.15
Imp/Det	271	8.42	5.53	Imp/Det	271	12.07	7.94
Stb	688	5.87	4.25	Stb	688	8.21	6.40
Stb/Det	321	7.36	5.68	Stb/Det	321	10.41	8.11
Det	427	6.11	5.37	Det	427	8.55	7.63
	R^2		0.015		R^2		0.021
	mean		7.55		mean		11.09
	n		7977		n		7977

Total episode

Nursing visits				All provider visits			
RN Dx Disch Status Pattern	N	Mean	SD	RN Dx Disch Status Pattern	N	Mean	SD
Imp	3069	11.00	12.01	Imp	3069	17.08	17.31
Imp/Stb	2660	11.98	13.26	Imp/Stb	2660	19.14	20.85
Imp/Stb/Det	540	16.44	18.77	Imp/Stb/Det	540	25.72	27.51
Imp/Det	271	14.95	16.55	Imp/Det	271	22.63	24.20
Stb	688	8.37	9.56	Stb	688	12.48	15.45
Stb/Det	322	12.16	13.62	Stb/Det	322	18.40	22.26
Det	427	9.83	11.19	Det	427	14.66	18.25
	R^2		0.019		R^2		0.022
	mean		11.59		mean		18.07
	n		7977		n		7977

*Imp = Improved. Stb = Stabilized. Det = Deteriorated

Table 9.9

Regression results as predictors of nursing visits, by first thirty days: Nursing diagnosis home health care components discharge statuses

Nursing visits			
Type	Variable	Coefficient	P value
Deteriorated	Role relationship	3.25	0.01
Improved	Tissue integrity	2.80	0.00
Deteriorated	Tissue integrity	2.80	0.00
Deteriorated	Metabolic	2.76	0.00
Deteriorated	Physical regulation	2.26	0.00
Improved	Metabolic	1.43	0.00
Stabilized	Tissue integrity	1.36	0.00
Improved	Physical regulation	1.32	0.00
Stabilized	Medication	1.01	0.06
Deteriorated	Health behavior	0.97	0.11
Improved	Fluid volume	0.78	0.00
Stabilized	Metabolic	0.77	0.00
Improved	Coping	0.63	0.06
Improved	Cognitive	0.62	0.00
Stabilized	Self-concept	0.57	0.29
Improved	Self-concept	0.40	0.29
Deteriorated	Digestive	0.39	0.37
Deteriorated	Fluid volume	0.35	0.42
Stabilized	Digestive	0.34	0.20
Deteriorated	Self-concept	0.33	0.72
Improved	Health behavior	0.31	0.16
Stabilized	Physical regulation	0.31	0.47
Improved	Tissue perfusion	0.26	0.24
Improved	Respiratory	0.24	0.24
Improved	Digestive	0.22	0.23
Improved	Sensory	0.20	0.32
Deteriorated	Coping	0.20	0.75
Stabilized	Respiratory	0.19	0.42
Deteriorated	Sensory	0.18	0.66
Stabilized	Cardiac output	0.16	0.42
Improved	Self-care	0.15	0.45
Deteriorated	Injury/safety	0.13	0.87
Deteriorated	Medication	0.11	0.92
Stabilized	Tissue perfusion	0.06	0.79
Stabilized	Sensory	−0.00	1.00
Deteriorated	Activity	−0.03	0.92
Improved	Cardiac output	−0.08	0.66
Deteriorated	Cardiac output	−0.09	0.80
Improved	Role relationship	−0.10	0.83
Deteriorated	Tissue perfusion	−0.15	0.71
Stabilized	Role relationship	−0.16	0.74

Table 9.9 (cont.)

Regression results as predictors of nursing visits, by first thirty days: Nursing diagnosis home health care components discharge statuses

	Nursing visits		
Type	Variable	Coefficient	P value
Improved	Nutritional	−0.18	0.41
Stabilized	Fluid volume	−0.18	0.64
Improved	Medication	−0.20	0.56
Stabilized	Nutritional	−0.22	0.49
Improved	Urinary elimination	−0.24	0.27
Stabilized	Health behavior	−0.24	0.51
Deteriorated	Cognitive	−0.25	0.46
Stabilized	Self-care	−0.28	0.28
Stabilized	Coping	−0.29	0.56
Stabilized	Cognitive	−0.30	0.12
Stabilized	Injury/safety	−0.35	0.35
Stabilized	Urinary elimination	−0.44	0.07
Improved	Injury/safety	−0.49	0.07
Deteriorated	Urinary elimination	−0.60	0.16
Stabilized	Activity	−0.63	0.00
Deteriorated	Respiratory	−0.64	0.05
Deteriorated	Self-care	−0.67	0.07
Improved	Activity	−0.85	0.00
Deteriorated	Nutritional	−0.90	0.02
	R^2		0.079
	mean		7.53
	intercept		6.39

Table 9.10

Regression results as predictors of nursing visits, all provider visits: Nursing diagnosis home health care components discharge statuses

All provider visits

Type	Variable	Coefficient	P value
Deteriorated	Role relationship	6.39	0.00
Deteriorated	Tissue integrity	3.28	0.00
Improved	Role relationship	3.25	0.00
Deteriorated	Metabolic	2.94	0.00
Improved	Tissue integrity	2.84	0.00
Improved	Self-care	2.77	0.00
Stabilized	Medication	2.27	0.00
Deteriorated	Physical regulation	2.13	0.02
Deteriorated	Health behavior	2.11	0.01
Improved	Activity	1.98	0.00
Improved	Metabolic	1.80	0.00
Stabilized	Self-care	1.67	0.00
Improved	Physical regulation	1.18	0.00
Improved	Coping	1.16	0.01
Deteriorated	Activity	1.03	0.02
Stabilized	Tissue integrity	0.98	0.01
Improved	Fluid volume	0.92	0.01
Stabilized	Metabolic	0.89	0.02
Improved	Cognitive	0.82	0.00
Improved	Sensory	0.78	0.01
Deteriorated	Self-concept	0.72	0.58
Improved	Health behavior	0.65	0.04
Deteriorated	Self-care	0.59	0.26
Stabilized	Digestive	0.53	0.15
Stabilized	Self-concept	0.52	0.18
Deteriorated	Sensory	0.52	0.37
Improved	Tissue perfusion	0.44	0.15
Improved	Urinary elimination	0.43	0.16
Stabilized	Urinary elimination	0.38	0.27
Deteriorated	Urinary elimination	0.34	0.57
Stabilized	Role relationship	0.20	0.77
Stabilized	Activity	0.19	0.50
Improved	Digestive	0.18	0.48
Deteriorated	Coping	0.13	0.88
Stabilized	Cardiac output	0.11	0.70
Deteriorated	Medication	0.08	0.96
Deteriorated	Fluid volume	0.08	0.90
Deteriorated	Digestive	0.03	0.97
Stabilized	Health behavior	−0.03	0.96
Stabilized	Tissue perfusion	−0.05	0.87
Stabilized	Nutritional	−0.07	0.88

Table 9.10 (cont.)

Regression results as predictors of nursing visits, all provider visits: Nursing diagnosis home health care components discharge statuses

All provider visits

Type	Variable	Coefficient	P value
Deteriorated	Tissue perfusion	-0.07	0.90
Improved	Cardiac output	-0.17	0.55
Stabilized	Physical regulation	-0.28	0.64
Improved	Respiratory	-0.29	0.31
Stabilized	Injury/safety	-0.30	0.57
Stabilized	Respiratory	-0.35	0.31
Deteriorated	Injury/safety	-0.35	0.74
Improved	Self-concept	-0.37	0.49
Deteriorated	Cognitive	-0.43	0.37
Stabilized	Sensory	-0.43	0.27
Stabilized	Cognitive	-0.49	0.07
Improved	Injury/safety	-0.52	0.17
Stabilized	Fluid volume	-0.76	0.16
Deteriorated	Cardiac output	-0.76	0.12
Improved	Nutritional	-0.81	0.01
Improved	Medication	-0.93	0.05
Deteriorated	Respiratory	-0.96	0.03
Stabilized	Coping	-1.00	0.15
Deteriorated	Nutritional	-1.01	0.06
	R^2		0.094
	mean		11.05
	intercept		8.47

Table 9.11

Regression results as predictors of nursing visits. by total episode: Nursing diagnosis home health care components discharge statuses

Nursing visits

Type	Variable	Coefficient	P value
Deteriorated	Physical regulation	8.99	0.00
Deteriorated	Tissue integrity	6.84	0.00
Deteriorated	Metabolic	6.70	0.00
Improved	Tissue integrity	5.30	0.00
Improved	Metabolic	4.74	0.00
Deteriorated	Medication	4.34	0.11
Stabilized	Metabolic	3.57	0.00
Stabilized	Medication	3.34	0.01
Deteriorated	Tissue perfusion	2.93	0.00
Deteriorated	Role relationship	2.49	0.36
Stabilized	Tissue integrity	2.47	0.00
Stabilized	Physical regulation	2.47	0.01
Deteriorated	Sensory	2.05	0.03
Improved	Physical regulation	2.05	0.00
Improved	Fluid volume	1.69	0.00
Stabilized	Urinary elimination	1.38	0.01
Deteriorated	Health behavior	1.21	0.39
Stabilized	Coping	1.14	0.32
Improved	Tissue perfusion	1.10	0.03
Deteriorated	Injury/safety	1.07	0.54
Stabilized	Self-concept	1.07	0.39
Improved	Coping	1.01	0.19
Improved	Health behavior	0.84	0.10
Stabilized	Sensory	0.80	0.21
Improved	Self-concept	0.79	0.37
Improved	Cognitive	0.76	0.01
Stabilized	Cardiac output	0.60	0.19
Stabilized	Digestive	0.58	0.34
Deteriorated	Self-care	0.56	0.51
Stabilized	Tissue perfusion	0.54	0.33
Deteriorated	Activity	0.53	0.45
Improved	Sensory	0.51	0.28
Stabilized	Injury/safety	0.47	0.59
Improved	Digestive	0.44	0.29
Deteriorated	Fluid volume	0.44	0.67
Deteriorated	Cardiac output	0.43	0.59
Deteriorated	Digestive	0.43	0.67
Improved	Urinary elimination	0.35	0.49
Improved	Respiratory	0.29	0.54
Stabilized	Health behavior	0.25	0.77
Improved	Cardiac output	0.14	0.75

Table 9.11 (cont.)

Regression results as predictors of nursing visits, by total episode: Nursing diagnosis home health care components discharge statuses

	Nursing visits		
Type	Variable	Coefficient	P value
Stabilized	Respiratory	-0.01	0.98
Improved	Self-care	-0.05	0.91
Deteriorated	Self-concept	-0.11	0.96
Improved	Role relationship	-0.16	0.88
Stabilized	Nutritional	-0.17	0.82
Stabilized	Self-care	-0.24	0.68
Stabilized	Role relationship	-0.32	0.77
Improved	Medication	-0.32	0.68
Deteriorated	Urinary elimination	-0.33	0.74
Deteriorated	Respiratory	-0.47	0.53
Improved	Nutritional	-0.54	0.27
Improved	Injury/safety	-0.67	0.29
Deteriorated	Nutritional	-0.76	0.39
Stabilized	Activity	-0.85	0.06
Deteriorated	Cognitive	-0.89	0.27
Stabilized	Fluid volume	-0.99	0.26
Improved	Activity	-1.09	0.00
Stabilized	Cognitive	-1.12	0.01
Deteriorated	Coping	-1.57	0.28
	R^2		0.73
	mean		11.56
	intercept		8.39

Table 9.12

Regression results as predictors of nursing visits, by total episode: Nursing diagnosis home health care components discharge statuses

All provider visits

Type	Variable	Coefficient	P value
Deteriorated	Physical regulation	9.85	0.00
Deteriorated	Metabolic	9.64	0.00
Deteriorated	Tissue integrity	8.88	0.00
Deteriorated	Medication	7.52	0.06
Deteriorated	Role relationship	7.42	0.07
Stabilized	Medication	7.36	0.00
Improved	Role relationship	7.26	0.00
Improved	Metabolic	7.09	0.00
Stabilized	Metabolic	5.87	0.00
Improved	Tissue integrity	5.67	0.00
Deteriorated	Tissue perfusion	5.40	0.00
Stabilized	Self-care	4.75	0.00
Deteriorated	Self-care	4.60	0.00
Stabilized	Urinary elimination	4.59	0.00
Improved	Self-care	4.14	0.00
Stabilized	Physical regulation	3.79	0.01
Improved	Activity	3.42	0.00
Deteriorated	Sensory	3.14	0.03
Improved	Physical regulation	2.47	0.01
Improved	Urinary elimination	2.16	0.00
Improved	Coping	2.02	0.09
Deteriorated	Health behavior	1.99	0.35
Deteriorated	Activity	1.90	0.07
Improved	Fluid volume	1.87	0.03
Stabilized	Injury/safety	1.87	0.15
Deteriorated	Urinary elimination	1.85	0.22
Stabilized	Tissue integrity	1.64	0.07
Improved	Tissue perfusion	1.62	0.03
Stabilized	Digestive	1.46	0.11
Improved	Sensory	1.32	0.06
Improved	Health behavior	1.16	0.14
Stabilized	Tissue perfusion	1.13	0.18
Improved	Cognitive	0.91	0.04
Stabilized	Health behavior	0.84	0.52
Improved	Digestive	0.80	0.21
Stabilized	Coping	0.69	0.69
Stabilized	Cardiac output	0.62	0.37
Stabilized	Activity	0.29	0.68
Stabilized	Sensory	0.11	0.91
Improved	Cardiac output	0.09	0.90
Improved	Self-concept	0.07	0.96

Table 9.12 (cont.)

Regression results as predictors of nursing visits, by total episode: Nursing diagnosis home health care components discharge statuses

All provider visits			
Type	Variable	Coefficient	P value
Deteriorated	Nutritional	0.00	1.00
Deteriorated	Fluid volume	-0.07	0.96
Stabilized	Nutritional	-0.09	0.94
Stabilized	Role relationship	-0.19	0.91
Improved	Respiratory	-0.24	0.74
Deteriorated	Cardiac output	-0.54	0.65
Stabilized	Self-concept	-0.57	0.76
Deteriorated	Injury/safety	-0.57	0.83
Deteriorated	Respiratory	-0.91	0.42
Deteriorated	Digestive	-0.94	0.54
Deteriorated	Cognitive	-0.96	0.43
Deteriorated	Self-concept	-1.06	0.74
Stabilized	Respiratory	-1.18	0.16
Improved	Injury/safety	-1.23	0.20
Improved	Medication	-1.33	0.25
Stabilized	Cognitive	-1.79	0.01
Improved	Nutritional	-2.07	0.01
Stabilized	Fluid volume	-2.32	0.08
Deteriorated	Coping	-3.38	0.12
	R^2		0.081
	mean		17.99
	intercept		11.60

Table 9.13
Regression results as predictors of nursing and all provider visits, by first thirty days and total episode: Nursing intervention home health care components

First thirty days of episodes

Nursing visits				All provider visits			
Rank	Variable	Coefficient	P value	Rank	Variable	Coefficient	P value
1	Wound care	3.48	0.00	1	Wound care	3.14	0.00
2	Metabolic	1.55	0.00	2	Metabolic	1.24	0.00
3	Physical regulation	0.73	0.00	3	Skilled observation	1.01	0.00
4	Fluid volume	0.54	0.00	4	Urinary elimination	0.95	0.00
5	Respiratory	0.34	0.05	5	Tissue integrity	0.93	0.00
6	Digestive	0.30	0.03	6	Digestive	0.74	0.00
7	Self-concept	0.29	0.23	7	Cognitive	0.74	0.03
8	Skilled observation	0.24	0.05	8	Physical regulation	0.73	0.00
9	Tissue perfusion	0.22	0.11	9	Health behavior	0.72	0.00
10	Medication	0.19	0.15	10	Self-care	0.50	0.06
11	Tissue integrity	0.18	0.19	11	Fluid volume	0.24	0.28
12	Urinary elimination	0.12	0.43	12	Medication	0.20	0.30
13	Sensory	0.01	0.97	13	Respiratory	0.19	0.45
14	Coping	-0.01	0.98	14	Injury/safety	0.16	0.48
15	Cardiac output	-0.02	0.86	15	Tissue perfusion	0.08	0.71
16	Nutritional	-0.05	0.70	16	Sensory	0.07	0.75
17	Self-care	-0.11	0.53	17	Cardiac output	-0.01	0.95
18	Health behavior	-0.17	0.19	18	Self-concept	-0.06	0.88
19	Injury/safety	-0.26	0.09	19	Role relationship	-0.20	0.63
20	Activity	-0.27	0.06	20	Activity	-0.38	0.07
21	Role relationship	-0.38	0.20	21	Nutritional	-0.44	0.02
22	Cognitive	-0.43	0.06	22	Coping	-0.63	0.05
R^2		0.105		R^2		0.061	
mean		7.519		mean		11.032	
intercept		5.398		intercept		7.905	

Total episode

Nursing visits				All provider visits			
Rank	Variable	Coefficient	P value	Rank	Variable	Coefficient	P value
1	Wound care	5.97	0.00	1	Wound care	5.07	0.00
2	Metabolic	3.95	0.00	2	Urinary elimination	4.74	0.00
3	Physical regulation	2.57	0.00	3	Metabolic	4.38	0.00
4	Urinary elimination	1.69	0.00	4	Physical regulation	3.66	0.00
5	Tissue integrity	1.49	0.00	5	Tissue integrity	3.52	0.00
6	Coping	0.69	0.18	6	Skilled observation	2.16	0.00
7	Sensory	0.62	0.10	7	Health behavior	1.35	0.00
8	Respiratory	0.60	0.14	8	Self-care	1.16	0.07
9	Skilled observation	0.57	0.04	9	Digestive	1.07	0.03
10	Digestive	0.51	0.11	10	Sensory	0.51	0.38
11	Medication	0.47	0.13	11	Injury/safety	0.51	0.34
12	Fluid volume	0.22	0.53	12	Respiratory	0.37	0.55
13	Cardiac output	0.03	0.91	13	Cognitive	0.35	0.67
14	Tissue perfusion	-0.08	0.81	14	Medication	0.31	0.52
15	Nutritional	-0.08	0.80	15	Cardiac output	-0.06	0.90
16	Self-care	-0.13	0.76	16	Tissue perfusion	-0.44	0.37
17	Injury/safety	-0.22	0.53	17	Coping	-0.45	0.57
18	Health behavior	-0.29	0.33	18	Nutritional	-0.64	0.18
19	Self-concept	-0.57	0.32	19	Fluid volume	-0.81	0.14
20	Activity	-0.77	0.02	20	Activity	-1.32	0.01
21	Cognitive	-1.14	0.03	21	Self-concept	-1.35	0.13
22	Role relationship	-1.52	0.03	22	Role relationship	-2.11	0.04
R^2		0.085		R^2		0.062	
mean		11.525		mean		17.947	
intercept		6.288		intercept		10.024	

Table 9.14

Mean results of nursing and all provider, by first thirty days: Number of nursing intervention (RN Rx) home health care components

Nursing visits				All provider visits			
RN Rx		Mean	SD	RN Rx		Mean	SD
0	26	2.31	2.46	0	26	10.03	8.51
1	473	5.03	3.67	1	473	8.72	6.27
2	822	7.41	6.76	2	822	10.20	8.18
3	934	7.27	6.17	3	934	10.33	8.15
4	900	7.27	5.66	4	900	10.37	7.73
5	968	7.21	5.47	5	968	10.23	7.47
6	899	7.89	5.72	6	898	11.24	7.85
7	857	7.62	5.43	7	856	10.88	7.91
8	706	7.97	5.73	8	706	11.70	8.10
9	596	8.21	5.61	9	595	12.28	8.34
10	446	8.11	5.47	10	446	12.28	8.42
11	334	8.28	4.99	11	334	12.53	8.16
12	236	8.17	4.99	12	236	13.05	8.01
13	160	8.36	5.41	13	160	14.16	8.89
14	111	8.26	4.72	14	111	13.10	8.64
15	42	8.52	4.01	15	42	12.99	9.21
16	24	9.83	8.06	16	24	18.72	15.98
17	15	7.87	4.75	17	15	9.21	5.93
18	4	9.75	3.86	18	4	24.79	8.61
19	1	21.00	0.00	19	1	24.35	0.00
R^2		0.020		R^2		0.023	
mean		7.52		mean		11.03	
n		8551		n		8551	

Table 9.15

Mean results of nursing and all provider, by total episode: Number of nursing intervention (RN Rx) home health care components

Nursing visits				All provider visits			
RN Rx		Mean	SD	RN Rx		Mean	SD
0	26	3.65	3.77	0	26	15.73	17.89
1	473	6.71	6.98	1	473	12.79	14.03
2	822	10.71	12.77	2	822	15.58	17.53
3	934	10.76	13.25	3	934	16.03	18.24
4	900	10.54	10.87	4	900	16.28	17.69
5	968	10.49	10.92	5	968	15.90	16.73
6	899	12.01	11.65	6	899	18.19	18.68
7	857	11.43	12.24	7	857	17.30	18.88
8	706	12.66	14.19	8	706	19.47	20.64
9	596	13.39	16.40	9	596	21.25	23.25
10	446	13.76	17.74	10	446	22.18	26.14
11	334	13.43	15.48	11	334	21.92	25.06
12	236	14.31	14.16	12	236	23.22	22.65
13	160	14.83	15.83	13	160	25.00	24.54
14	111	14.95	13.80	14	111	26.09	29.45
15	42	14.45	11.26	15	42	22.32	19.87
16	24	13.17	9.42	16	24	25.67	23.39
17	15	16.07	18.82	17	15	19.66	22.55
18	4	15.00	4.24	18	4	37.98	9.40
19	1	59.00	0.00	19	1	62.35	0.00
R^2		0.021		R^2		0.023	
mean		11.53		mean		19.95	
n		8554		n		8554	

Table 9.16

Mean results of nursing and all provider visits, by first thirty days and total episode: Nursing intervention type patterns*

First thirty days							
Nursing visits				All provider visits			
Type RN Rx Pattern	N	Mean	SD	Type RN Rx Pattern	N	Mean	SD
A	302	4.78	3.27	A	302	8.58	6.60
A/C	775	7.95	7.21	A/C	775	10.94	8.73
A/M	87	4.33	3.49	A/M	87	10.44	6.82
A/T	1103	5.67	3.28	A/T	1103	8.60	6.24
A/M/T	380	5.75	3.26	A/M/T	380	9.56	6.52
A/C/M	118	8.91	7.91	A/C/M	118	12.94	9.21
A/C/T	2980	8.13	5.98	A/C/T	2980	11.32	8.12
A/C/M/T	1342	8.22	5.75	A/C/M/T	1342	12.92	8.69
C	73	7.79	5.95	C	73	10.40	8.07
C/T	974	8.15	5.93	C/T	974	11.36	8.26
C/M	84	6.89	4.11	C/M	84	11.02	6.52
C/M/T	307	7.84	5.13	C/M/T	307	11.83	7.99
	R^2		0.039		R^2		0.027
	mean		7.53		mean		11.04
	n		8525		n		8525

Total episode							
Nursing visits				All provider visits			
Type RN Rx Pattern	N	Mean	SD	Type RN Rx Pattern	N	Mean	SD
A	302	5.92	4.81	A	302	11.77	12.40
A/C	775	12.42	14.84	A/C	775	18.08	20.08
A/M	87	8.02	6.19	A/M	87	16.24	14.20
A/T	1104	7.05	5.45	A/T	1104	11.53	11.92
A/M/T	380	7.55	5.43	A/M/T	380	13.58	12.38
A/C/M	118	15.60	18.49	A/C/M	118	25.15	28.04
A/C/T	2981	12.97	14.02	A/C/T	2981	19.30	21.56
A/C/M/T	1343	13.44	15.19	A/C/M/T	1343	22.26	23.18
C	73	13.89	14.19	C	73	18.31	17.15
C/T	974	12.37	14.15	C/T	974	18.06	19.32
C/M	84	9.06	5.90	C/M	84	16.50	17.35
C/M/T	307	11.43	10.72	C/M/T	307	17.97	16.81
	R^2		0.038		R^2		0.030
	mean		11.55		mean		17.95
	n		8528		n		8528

*A = Assess, C = Care, M = Manage, T = Teach

Table 9.17

Regression results as predictors of nursing visits, by first thirty days: Nursing intervention home health care components type

Type	Variable	Nursing visits Coefficient	P value
Manage	Wound care	11.95	0.00
Manage	Skilled observation	10.95	0.04
Manage	Fluid volume	4.26	0.42
Care	Wound care	3.89	0.00
Manage	Role relationship	3.85	0.30
Care	Fluid volume	2.80	0.00
Manage	Injury/safety	1.95	0.47
Manage	Urinary elimination	1.93	0.61
Care	Metabolic	1.74	0.00
Care	Medication	1.19	0.00
Teach	Nutritional	1.18	0.17
Care	Physical regulation	0.99	0.00
Care	Self-concept	0.99	0.41
Manage	Physical regulation	0.97	0.22
Teach	Metabolic	0.95	0.00
Care	Tissue integrity	0.93	0.00
Teach	Skilled observation	0.78	0.50
Teach	Respiratory	0.71	0.01
Care	Activity	0.70	0.41
Teach	Wound care	0.53	0.02
Assess	Wound care	0.51	0.01
Assess	Self-concept	0.48	0.07
Teach	Tissue perfusion	0.47	0.00
Care	Health behavior	0.43	0.34
Assess	Physical regulation	0.43	0.00
Teach	Cognitive	0.41	0.45
Care	Role relationship	0.41	0.72
Assess	Skilled observation	0.38	0.07
Care	Sensory	0.33	0.67
Assess	Fluid volume	0.32	0.12
Manage	Digestive	0.31	0.93
Care	Digestive	0.29	0.10
Assess	Metabolic	0.27	0.29
Assess	Urinary elimination	0.27	0.20
Manage	Metabolic	0.26	0.93
Care	Urinary elimination	0.22	0.36
Teach	Medication	0.21	0.11
Care	Nutritional	0.19	0.77
Teach	Tissue integrity	0.14	0.46
Care	Injury/safety	0.13	0.90
Teach	Injury/safety	0.09	0.70
Assess	Health behavior	0.09	0.82
Teach	Digestive	0.08	0.75
Assess	Role relationship	0.07	0.70
Teach	Fluid volume	0.04	0.81
Assess	Medication	0.01	0.79
Assess	Cardiac output	0.01	0.78
Manage	Health behavior	0.02	0.93

Table 9.17 (cont.)

Regression results as predictors of nursing visits, by first thirty days: Nursing intervention home health care components type

Type	Variable	Nursing visits Coefficient	P value
Teach	Cardiac output	0.02	0.92
Teach	Role relationship	0.02	0.91
Assess	Injury/safety	0.01	0.95
Teach	Self-care	0.00	0.00
Manage	Sensory	0.00	0.00
Manage	Self-care	0.00	0.00
Manage	Nutritional	0.00	0.00
Manage	Cognitive	0.00	0.00
Care	Self-care	0.00	0.00
Assess	Self-care	0.00	0.00
Teach	Health behavior	-0.01	0.95
Teach	Activity	-0.03	0.87
Teach	Physical regulation	-0.05	0.75
Care	Coping	-0.07	0.82
Teach	Coping	-0.08	0.80
Manage	Coping	-0.10	0.93
Assess	Digestive	-0.10	0.58
Assess	Tissue perfusion	-0.14	0.47
Assess	Coping	-0.20	0.64
Assess	Tissue integrity	-0.20	0.20
Assess	Activity	-0.21	0.31
Teach	Urinary elimination	-0.23	0.29
Care	Cardiac output	-0.38	0.87
Assess	Respiratory	-0.40	0.41
Teach	Self-concept	-0.41	0.48
Assess	Sensory	-0.48	0.79
Assess	Cognitive	-0.53	0.03
Assess	Nutritional	-0.75	0.43
Manage	Medication	-0.92	0.48
Teach	Sensory	-1.00	0.37
Manage	Cardiac output	-1.09	0.62
Manage	Self-concept	-1.41	0.79
Care	Respiratory	-1.50	0.04
Care	Tissue perfusion	-1.66	0.01
Manage	Tissue integrity	-1.66	0.62
Care	Cognitive	-1.98	0.62
Manage	Respiratory	-2.17	0.68
Manage	Tissue perfusion	-2.25	0.24
Care	Skilled observation	-2.73	0.47
Manage	Activity	-3.65	0.50
	R^2		0.146
	mean		7.53
	intercept		5.16

Table 9.18

Regression results as predictors of nursing visits, by first thirty days: Nursing intervention home health care components type

All provider visits			
Type	Variable	Coefficient	P value
Manage	Wound care	14.84	0.01
Manage	Skilled observation	8.32	0.28
Care	Wound care	3.33	0.00
Manage	Urinary elimination	3.27	0.55
Manage	Injury/safety	2.93	0.46
Teach	Cognitive	2.57	0.00
Manage	Metabolic	2.02	0.65
Care	Tissue integrity	1.80	0.00
Care	Activity	1.60	0.21
Care	Fluid volume	1.51	0.01
Manage	Coping	1.49	0.37
Care	Digestive	1.40	0.00
Care	Physical regulation	1.39	0.00
Assess	Urinary elimination	0.98	0.00
Teach	Metabolic	0.97	0.00
Teach	Tissue integrity	0.95	0.00
Care	Medication	0.93	0.01
Manage	Role relationship	0.92	0.87
Teach	Skilled observation	0.91	0.59
Assess	Wound care	0.90	0.00
Care	Metabolic	0.82	0.05
Teach	Nutritional	0.76	0.55
Teach	Injury/safety	0.75	0.03
Care	Role relationship	0.74	0.65
Manage	Physical regulation	0.67	0.57
Teach	Tissue perfusion	0.61	0.00
Care	Health behavior	0.54	0.41
Assess	Self-concept	0.50	0.19
Assess	Fluid volume	0.47	0.12
Assess	Cognitive	0.44	0.21
Teach	Wound care	0.30	0.38
Assess	Physical regulation	0.30	0.15
Care	Urinary elimination	0.29	0.40
Assess	Health behavior	0.29	0.27
Care	Nutritional	0.27	0.78
Teach	Digestive	0.26	0.44
Teach	Physical regulation	0.22	0.33
Teach	Medication	0.19	0.31
Manage	Health behavior	0.17	0.64
Assess	Skilled observation	0.16	0.60
Assess	Cardiac output	0.16	0.45
Care	Injury/safety	0.08	0.96
Teach	Urinary elimination	0.07	0.83
Teach	Respiratory	0.06	0.88
Assess	Medication	0.01	0.96
Teach	Self-care	0.00	0.00
Manage	Sensory	0.00	0.00

Table 9.18 (cont.)

Regression results as predictors of nursing visits, by first thirty days:
Nursing intervention home health care components type

Type	Variable	Coefficient	P value
	All provider visits		
Manage	Self-care	0.00	0.00
Manage	Nutritional	0.00	0.00
Manage	Cognitive	0.00	0.00
Care	Self-care	0.00	0.00
Assess	Self-care	0.00	0.00
Assess	Metabolic	-0.02	0.97
Assess	Digestive	-0.03	0.91
Assess	Activity	-0.06	0.84
Assess	Tissue integrity	-0.10	0.67
Assess	Injury/safety	-0.12	0.67
Assess	Role relationship	-0.13	0.65
Teach	Cardiac output	-0.14	0.61
Assess	Tissue perfusion	-0.19	0.49
Teach	Role relationship	-0.20	0.31
Teach	Fluid volume	-0.21	0.43
Care	Coping	-0.23	0.60
Care	Self-concept	-0.24	0.89
Teach	Health behavior	-0.29	0.32
Care	Sensory	-0.34	0.77
Manage	Fluid volume	-0.38	0.96
Teach	Activity	-0.41	0.12
Teach	Coping	-0.55	0.25
Teach	Self-concept	-0.59	0.50
Manage	Cardiac output	-0.65	0.84
Assess	Coping	-0.70	0.27
Teach	Sensory	-0.89	0.59
Manage	Tissue integrity	-1.02	0.84
Assess	Respiratory	-1.04	0.15
Manage	Medication	-1.27	0.50
Assess	Nutritional	-1.36	0.32
Care	Tissue perfusion	-1.84	0.06
Care	Respiratory	-1.97	0.06
Assess	Sensory	-2.18	0.41
Care	Cardiac output	-2.64	0.43
Care	Skilled observation	-3.32	0.55
Manage	Tissue perfusion	-3.42	0.22
Manage	Digestive	-3.52	0.52
Care	Cognitive	-3.84	0.51
Manage	Respiratory	-3.84	0.62
Manage	Self-concept	-4.75	0.54
Manage	Activity	-5.68	0.48
	R^2		0.081
	mean		11.04
	intercept		8.35

Table 9.19

Regression results as predictors of nursing visits, by total episode: Nursing intervention home health care components type

Type	Variable	Nursing visits Coefficient	P value
Manage	Wound care	27.45	0.00
Manage	Fluid volume	20.20	0.10
Manage	Injury/safety	14.20	0.02
Manage	Skilled observation	7.82	0.52
Care	Wound care	6.94	0.00
Care	Fluid volume	6.18	0.00
Manage	Tissue integrity	5.97	0.44
Manage	Physical regulation	5.14	0.00
Care	Tissue integrity	4.60	0.00
Care	Physical regulation	4.27	0.00
Care	Medication	4.21	0.00
Manage	Metabolic	4.02	0.57
Care	Nutritional	3.53	0.02
Teach	Nutritional	2.95	0.14
Teach	Metabolic	2.57	0.00
Care	Urinary elimination	2.45	0.00
Teach	Sensory	2.41	0.35
Care	Self-concept	2.33	0.40
Care	Sensory	2.31	0.21
Assess	Metabolic	2.06	0.00
Assess	Wound care	1.76	0.00
Care	Metabolic	1.75	0.01
Teach	Respiratory	1.73	0.01
Assess	Skilled observation	1.64	0.00
Manage	Urinary elimination	1.58	0.86
Care	Activity	1.50	0.45
Care	Role relationship	1.41	0.59
Care	Health behavior	1.08	0.30
Care	Digestive	0.90	0.03
Care	Coping	0.89	0.20
Assess	Injury/safety	0.82	0.06
Assess	Physical regulation	0.81	0.01
Manage	Role relationship	0.81	0.93
Teach	Cardiac output	0.80	0.07
Assess	Urinary elimination	0.76	0.11
Care	Tissue perfusion	0.65	0.67
Manage	Health behavior	0.62	0.27
Teach	Tissue integrity	0.58	0.17
Teach	Digestive	0.44	0.42
Teach	Medication	0.43	0.15
Manage	Digestive	0.43	0.96
Teach	Injury/safety	0.41	0.46
Assess	Cardiac output	0.38	0.25
Assess	Fluid volume	0.31	0.52
Teach	Tissue perfusion	0.30	0.37
Assess	Role relationship	0.30	0.19
Assess	Medication	0.28	0.14
Assess	Health behavior	0.28	0.50

Table 9.19 (cont.)

Regression results as predictors of nursing visits, by total episode: Nursing intervention home health care components type

Type	Variable	Nursing visits Coefficient	P value
Assess	Tissue perfusion	0.18	0.69
Teach	Wound care	0.16	0.77
Teach	Role relationship	0.15	0.63
Teach	Cognitive	0.14	0.91
Care	Injury/safety	0.08	0.97
Manage	Medication	0.01	1.00
Teach	Self-care	0.00	0.00
Manage	Sensory	0.00	0.00
Manage	Self-care	0.00	0.00
Manage	Nutritional	0.00	0.00
Manage	Cognitive	0.00	0.00
Care	Self-care	0.00	0.00
Assess	Self-care	0.00	0.00
Teach	Health behavior	-0.01	0.98
Assess	Tissue integrity	-0.08	0.82
Teach	Physical regulation	-0.13	0.71
Assess	Self-concept	-0.20	0.74
Teach	Self-concept	-0.22	0.87
Assess	Coping	-0.26	0.79
Teach	Activity	-0.31	0.46
Teach	Skilled observation	-0.34	0.90
Teach,	Coping	-0.36	0.64
Teach	Urinary elimination	-0.38	0.46
Assess	Activity	-0.40	0.40
Assess	Digestive	-0.53	0.22
Assess	Respiratory	-0.74	0.52
Teach	Fluid volume	-0.78	0.06
Assess	Cognitive	-1.13	0.04
Care	Skilled observation	-1.62	0.85
Care	Cardiac output	-1.87	0.72
Assess	Nutritional	-1.92	0.38
Care	Cognitive	-1.92	0.83
Care	Respiratory	-2.09	0.21
Assess	Sensory	-2.19	0.60
Manage	Coping	-2.54	0.33
Manage	Self-concept	-2.60	0.83
Manage	Cardiac output	-3.59	0.47
Manage	Activity	-5.65	0.65
Manage	Respiratory	-7.44	0.54
Manage	Tissue perfusion	-7.59	0.08
	R^2		0.143
	mean		11.55
	intercept		5.25

Table 9.20

Regression results as predictors of nursing visits, by total episode: Nursing intervention home health care components type

Type	Variable	All provider visits Coefficient	P value
Manage	Wound care	37.86	0.01
Manage	Injury/safety	24.66	0.01
Care	Skilled observation	15.27	0.26
Manage	Tissue integrity	9.10	0.45
Care	Tissue integrity	7.69	0.00
Manage	Fluid volume	7.57	0.69
Care	Physical regulation	7.09	0.00
Care	Wound care	6.08	0.00
Manage	Physical regulation	5.70	0.04
Care	Nutritional	5.30	0.02
Care	Medication	5.05	0.00
Care	Urinary elimination	5.00	0.00
Manage	Skilled observation	4.22	0.82
Care	Fluid volume	4.03	0.00
Care	Tissue perfusion	3.91	0.10
Manage	Coping	3.89	0.34
Care	Role relationship	3.87	0.33
Teach	Cognitive	3.84	0.05
Manage	Medication	3.82	0.41
Teach	Nutritional	3.70	0.23
Teach	Metabolic	3.05	0.00
Manage	Metabolic	3.05	0.78
Teach	Sensory	2.90	0.47
Manage	Urinary elimination	2.76	0.84
Care	Self-conceptSelf-conceptSelf-c	2.61	0.54
Care	Activity	2.55	0.41
Care	Digestive	2.44	0.00
Assess	Metabolic	2.33	0.01
Assess	Urinary elimination	2.19	0.00
Teach	Tissue integrity	2.18	0.00
Assess	Wound care	2.14	0.00
Assess	Skilled observation	2.04	0.01
Care	Sensory	1.97	0.49
Assess	Injury/safety	0.94	0.17
Assess	Cardiac output	0.89	0.08
Teach	Injury/safety	0.86	0.31
Care	Coping	0.80	0.46
Assess	Physical regulation	0.79	0.11
Teach	Respiratory	0.77	0.45
Assess	Health behavior	0.76	0.23
Manage	Health behavior	0.68	0.44
Teach	Digestive	0.66	0.44
Teach	Urinary elimination	0.51	0.52
Assess	Tissue perfusion	0.50	0.46
Care	Metabolic	0.44	0.66
Teach	Physical regulation	0.41	0.15
Assess	Role relationship	0.38	0.57
Teach	Tissue perfusion	0.33	0.53

Table 9.20 (cont.)

Regression results as predictors of nursing visits, by total episode: Nursing intervention home health care components type

Type	Variable	All provider visits Coefficient	P value
Teach	Medication	0.32	0.49
Assess	Tissue integrity	0.29	0.61
Assess	Fluid volume	0.28	0.71
Assess	Medication	0.24	0.67
Care	Health behavior	0.18	0.91
Teach	Cardiac output	0.16	0.82
Assess	Cognitive	0.09	0.91
Teach	Self-care	0.00	0.00
Manage	Sensory	0.00	0.00
Manage	Self-care	0.00	0.00
Manage	Nutritional	0.00	0.00
Manage	Cognitive	0.00	0.00
Care	Self-care	0.00	0.00
Assess	Self-care	0.00	0.00
Teach	Role relationship	−0.04	0.93
Teach	Wound care	−0.09	0.91
Teach	Self-concept	−0.14	0.95
Teach	Health behavior	−0.19	0.79
Assess	Activity	−0.24	0.74
Assess	Self-concept	−0.50	0.60
Assess	Digestive	−0.50	0.46
Teach	Activity	−1.06	0.11
Care	Injury/safety	−1.27	0.73
Assess	Coping	−1.31	0.39
Teach	Fluid volume	−1.71	0.01
Teach	Coping	−1.85	0.11
Care	Respiratory	−1.89	0.47
Teach	Skilled observation	−2.81	0.49
Assess	Respiratory	−3.25	0.07
Assess	Nutritional	−3.71	0.27
Manage	Digestive	−4.26	0.75
Assess	Sensory	−4.73	0.47
Care	Cardiac output	−4.97	0.54
Manage	Cardiac output	−5.20	0.50
Manage	Role relationship	−5.41	0.69
Manage	Self-concept	−7.07	0.71
Care	Cognitive	−7.08	0.62
Manage	Activity	−10.27	0.60
Manage	Respiratory	−10.45	0.58
Manage	Tissue perfusion	−11.04	0.10
	R^2		0.109
	mean		17.95
	intercept		9.70

Table 9.21
Mean nursing and all provider visits, by first thirty days and total episode: Medical diagnoses or surgical procedures

First thirty days of episode

	Nursing visits				All provider visits		
Med Dx/Rx	N	Mean	SD	Med Dx/Rx	N	Mean	SD
OP Nervous	111	8.07	5.74	OP Nervous	111	12.95	8.63
OP Eye	91	7.74	5.82	OP Eye	91	10.82	8.57
OP Respiratory	131	6.76	4.00	OP Respiratory	131	9.54	7.58
OP Cardiovascular	448	8.77	6.28	OP Cardiovascular	448	11.84	8.68
OP Digestive	615	9.33	7.55	OP Digestive	615	11.49	8.69
OP Urinary	129	7.93	5.25	OP Urinary	129	10.80	7.53
OP Musculoskeletal	665	7.11	6.06	OP Musculoskeletal	665	14.13	8.63
OP Integumentary	197	12.31	9.53	OP Integumentary	197	14.59	11.15
Infectious	165	8.25	7.81	Infectious	165	11.69	9.41
Neoplasms	425	6.50	4.26	Neoplasms	425	9.27	6.44
Endocrine	520	8.04	5.50	Endocrine	520	9.93	6.85
Nervous System	230	6.01	4.09	Nervous System	230	10.05	7.18
Circulatory	1892	6.92	4.20	Circulatory	1892	10.88	8.05
Respiratory	589	6.74	3.83	Respiratory	589	9.04	5.92
Digestive	248	6.52	5.20	Digestive	248	8.54	6.98
Genitourinary	177	6.46	4.52	Genitourinary	177	9.53	7.21
Skin	254	10.80	8.06	Skin	254	13.12	8.99
Musculoskeletal	181	5.92	4.54	Musculoskeletal	181	10.93	7.29
Symptoms, Signs	332	6.40	4.81	Symptoms, Signs	332	10.43	7.72
Injury, Poison	554	7.65	5.91	Injury, Poison	554	12.71	8.08
R^2		0.053		R^2		0.037	
mean		7.545		mean		11.136	
n		7954		n		7954	

Total episode

	Nursing visits				All provider visits		
Med Dx/Rx	N	Mean	SD	Med Dx/Rx	N	Mean	SD
OP Nervous	111	11.91	11.56	OP Nervous	111	19.58	18.03
OP Eye	91	11.13	12.42	OP Eye	91	17.13	22.15
OP Respiratory	131	10.98	12.08	OP Respiratory	131	16.11	17.78
OP Cardiovascular	448	12.39	11.54	OP Cardiovascular	448	17.44	17.13
OP Digestive	615	13.28	14.92	OP Digestive	615	16.78	17.88
OP Urinary	129	13.33	15.79	OP Urinary	129	19.04	23.51
OP Musculoskeletal	665	11.21	13.44	OP Musculoskeletal	665	23.60	21.67
OP Integumentary	197	19.22	21.27	OP Integumentary	197	24.06	27.87
Infectious	165	12.11	14.10	Infectious	165	18.20	19.33
Neoplasms	425	10.73	10.80	Neoplasms	425	15.74	16.28
Endocrine	520	11.96	11.25	Endocrine	520	15.79	16.55
Nervous System	230	10.08	18.04	Nervous System	230	17.41	23.39
Circulatory	1893	10.54	11.25	Circulatory	1893	17.81	20.45
Respiratory	589	9.72	7.63	Respiratory	589	14.13	14.43
Digestive	248	9.69	10.47	Digestive	248	14.12	18.04
Genitourinary	177	10.07	9.83	Genitourinary	177	17.25	21.13
Skin	254	21.04	24.65	Skin	254	27.08	30.79
Musculoskeletal	181	10.26	15.30	Musculoskeletal	181	18.83	23.32
Symptoms, Signs	332	9.77	9.04	Symptoms, Signs	332	17.71	17.52
Injury, Poison	555	11.28	12.98	Injury, Poison	555	19.32	18.54
R^2		0.032		R^2		0.022	
mean		11.580		mean		18.131	
n		7956		n		7956	

Table 9.22

Regression results as predictors of nursing and all provider visits, by first thirty days: Nursing diagnosis (RN Dx) home health care components and demographic (Demo) variables

Nursing visits					All provider visits				
Rank	Type	Variable	Coefficient	P value	Rank	Type	Variable	Coefficient	P value
1	RN Dx	Tissue integrity	2.70	0.00	1	RN Dx	Tissue integrity	2.71	0.00
2	RN Dx	Physical regulation	1.19	0.00	2	RN Dx	Self-care	2.18	0.00
3	RN Dx	Metabolic	1.09	0.00	3	RN Dx	Role relationship	1.84	0.00
4	Demo	Careself	0.85	0.00	4	RN Dx	Activity	1.63	0.00
5	Demo	Petshome	0.61	0.00	5	RN Dx	Metabolic	1.26	0.00
6	Demo	Comprehends	0.60	0.00	6	RN Dx	Physical regulation	0.94	0.00
7	Demo	Married	0.50	0.00	7	Demo	Married	0.74	0.00
8	RN Dx	Fluid volume	0.50	0.01	8	Demo	Petshome	0.66	0.02
9	RN Dx	Coping	0.47	0.06	9	Demo	Comprehends	0.63	0.00
10	RN Dx	Cognitive	0.44	0.00	10	RN Dx	Health behavior	0.63	0.02
11	RN Dx	Self-concept	0.30	0.28	11	RN Dx	Cognitive	0.59	0.00
12	RN Dx	Digestive	0.24	0.10	12	RN Dx	Coping	0.53	0.14
13	RN Dx	Health behavior	0.22	0.24	13	RN Dx	Careself	0.49	0.03
14	RN Dx	Medication	0.21	0.43	14	RN Dx	Sensory	0.46	0.04
15	Demo	Alone	0.16	0.37	15	RN Dx	Fluid volume	0.31	0.25
16	RN Dx	Respiratory	0.08	0.56	16	RN Dx	Medication	0.19	0.62
17	RN Dx	Tissue perfusion	0.06	0.71	17	RN Dx	Tissue perfusion	0.16	0.46
18	RN Dx	Sensory	0.04	0.80	18	RN Dx	Digestive	0.11	0.62
19	RN Dx	Cardiac output	0.03	0.82	19	RN Dx	Urinary elimination	0.02	0.93
20	RN Dx	Self-care	-0.01	0.95	20	Demo	House	0.01	0.95
21	Demo	Age	-0.03	0.00	21	Demo	Age	-0.02	0.06
22	RN Dx	Role relationship	-0.05	0.86	22	RN Dx	Self-concept	-0.05	0.90
23	Demo	Male	-0.13	0.33	23	RN Dx	Cardiac output	-0.14	0.48
24	Demo	White	-0.13	0.37	24	Demo	Alone	-0.19	0.44
25	Demo	House	-0.14	0.32	25	RN Dx	Respiratory	-0.33	0.11
26	RN Dx	Urinary elimination	-0.31	0.05	26	Demo	Communicates	-0.45	0.07
27	RN Dx	Nutritional	-0.36	0.03	27	Demo	Male	-0.47	0.01
28	RN Dx	Injury/safety	-0.46	0.03	28	RN Dx	Injury/safety	-0.52	0.08
29	RN Dx	Activity	-0.59	0.00	29	Demo	White	-0.57	0.01
30	Demo	Communicates	-0.95	0.00	30	RN Dx	Nutritional	-0.94	0.00
		R^2	0.080				R^2	0.074	
		mean	7.51				mean	11.03	
		intercept	8.48				intercept	9.49	

Table 9.23

Regression results as predictors of nursing and all provider visits, by total episode: Nursing diagnoses (RN Dx) home health care components and demographic (Demo) variables

Nursing visits					All provider visits				
Rank	Type	Variable	Coefficient	P value	Rank	Type	Variable	Coefficient	P value
1	RN Dx	Tissue integrity	5.15	0.00	1	RN Dx	Metabolic	6.37	0.00
2	RN Dx	Metabolic	4.14	0.00	2	RN Dx	Tissue integrity	5.50	0.00
3	RN Dx	Physical regulation	2.89	0.00	3	RN Dx	Self-care	4.62	0.00
4	Demo	Petshome	1.54	0.00	4	RN Dx	Role relationship	3.57	0.00
5	RN Dx	Coping	1.07	0.07	5	RN Dx	Physical regulation	3.50	0.00
6	Demo	Careself	1.01	0.01	6	RN Dx	Activity	2.90	0.00
7	RN Dx	Tissue perfusion	0.99	0.00	7	RN Dx	Urinary elimination	2.48	0.00
8	RN Dx	Sensory	0.97	0.01	8	RN Dx	Tissue perfusion	1.99	0.00
9	RN Dx	Fluid volume	0.97	0.03	9	Demo	Petshome	1.92	0.01
10	RN Dx	Medication	0.91	0.15	10	RN Dx	Sensory	1.81	0.00
11	Demo	Comprehends	0.89	0.01	11	RN Dx	Medication	1.70	0.07
12	RN Dx	Urinary elimination	0.84	0.02	12	Demo	Married	1.50	0.00
13	Demo	Married	0.71	0.04	13	Demo	Comprehends	1.35	0.01
14	Demo	Alone	0.52	0.20	14	RN Dx	Coping	1.08	0.23
15	RN Dx	Digestive	0.50	0.15	15	Demo	House	1.05	0.03
16	RN Dx	Cardiac output	0.42	0.19	16	RN Dx	Health behavior	0.75	0.25
17	RN Dx	Health behavior	0.40	0.35	17	Demo	Careself	0.55	0.34
18	Demo	House	0.39	0.23	18	RN Dx	Digestive	0.54	0.30
19	RN Dx	Cognitive	0.38	0.17	19	RN Dx	Cognitive	0.49	0.24
20	RN Dx	Self-concept	0.36	0.58	20	RN Dx	Fluid volume	0.41	0.54
21	RN Dx	Self-care	0.25	0.46	21	RN Dx	Cardiac output	0.36	0.45
22	RN Dx	Respiratory	0.22	0.51	22	Demo	Communicates	0.14	0.82
23	Demo	Age	-0.05	0.00	23	Demo	Age	-0.04	0.07
24	Demo	White	-0.08	0.82	24	Demo	Alone	-0.19	0.76
25	Demo	Male	-0.17	0.59	25	RN Dx	Respiratory	-0.25	0.63
26	RN Dx	Role relationship	-0.36	0.62	26	RN Dx	Injury/safety	-0.53	0.47
27	RN Dx	Nutritional	-0.42	0.27	27	RN Dx	Self-concept	-0.60	0.54
28	RN Dx	Injury/safety	-0.44	0.36	28	Demo	White	-0.62	0.23
29	RN Dx	Activity	-0.64	0.03	29	Demo	Male	-0.93	0.05
30	Demo	Communicates	-1.15	0.00	30	RN Dx	Nutritional	-1.32	0.02
		R^2	0.066				R^2	0.073	
		mean	11.51				mean	17.93	
		intercept	10.89				intercept	11.34	

Table 9.24

Regression results as predictors of nursing visits, by first thirty days: Nursing intervention (RN Rx) home health care components and demographic (Demo) variables

Rank	Type	Variable	Coefficient	P value
1	RN Rx	Wound care	3.40	0.00
2	RN Rx	Metabolic	1.45	0.00
3	Demo	Careself	0.85	0.00
4	Demo	Petshome	0.77	0.00
5	RN Rx	Physical regulation	0.75	0.00
6	Demo	Comprehends	0.57	0.00
7	RN Rx	Fluid volume	0.57	0.00
8	Demo	Married	0.39	0.01
9	RN Rx	Respiratory	0.34	0.05
10	RN Rx	Digestive	0.29	0.04
11	RN Rx	Tissue integrity	0.28	0.04
12	RN Rx	Tissue perfusion	0.26	0.06
13	RN Rx	Skilled observation	0.25	0.04
14	RN Rx	Urinary elimination	0.24	0.11
15	RN Rx	Self-concept	0.24	0.33
16	RN Rx	Medication	0.12	0.39
17	Demo	Alone	0.09	0.60
18	RN Rx	Coping	0.03	0.88
19	RN Rx	Sensory	0.01	0.93
20	Demo	Age	−0.01	0.02
21	RN Rx	Cardiac output	−0.05	0.72
22	RN Rx	Self-care	−0.05	0.79
23	RN Rx	Nutritional	−0.06	0.64
24	Demo	White	−0.11	0.46
25	Demo	Male	−0.16	0.21
26	RN Rx	Health behavior	−0.20	0.12
27	RN Rx	Injury/safety	−0.24	0.11
28	RN Rx	Activity	−0.28	0.05
29	Demo	House	−0.29	0.03
30	RN Rx	Role relationship	−0.37	0.20
31	RN Rx	Cognitive	−0.42	0.06
32	Demo	Communicates	−0.65	0.00
		R^2	0.114	
		mean	7.51	
		intercept	6.44	

Table 9.25

Regression results as predictors of all provider visits, by first thirty days: Nursing intervention (RN Rx) home health care components and demographic (Demo) variables

Rank	Type	Variable	Coefficient	P value
1	RN Rx	Wound care	3.14	0.00
2	RN Rx	Metabolic	1.10	0.00
3	RN Rx	Skilled observation	0.99	0.00
4	RN Rx	Tissue integrity	0.89	0.00
5	RN Rx	Urinary elimination	0.89	0.00
6	RN Rx	Physical regulation	0.74	0.00
7	RN Rx	Cognitive	0.73	0.03
8	RN Rx	Digestive	0.71	0.00
9	Demo	Petshome	0.71	0.01
10	RN Rx	Health behavior	0.70	0.00
11	Demo	Married	0.67	0.00
12	RN Rx	Self-care	0.50	0.06
13	Demo	Comprehends	0.43	0.05
14	Demo	Careself	0.27	0.25
15	RN Rx	Respiratory	0.22	0.39
16	RN Rx	Fluid volume	0.22	0.33
17	RN Rx	Injury/safety	0.16	0.47
18	RN Rx	Medication	0.15	0.44
19	RN Rx	Sensory	0.15	0.52
20	RN Rx	Tissue perfusion	0.11	0.57
21	RN Rx	Cardiac output	0.00	0.98
22	Demo	Age	−0.01	0.55
23	Demo	Communicates	−0.05	0.85
24	Demo	Alone	−0.08	0.75
25	Demo	House	−0.09	0.63
26	RN Rx	Self-concept	−0.10	0.78
27	RN Rx	Role relationship	−0.20	0.63
28	RN Rx	Activity	−0.33	0.11
29	RN Rx	Nutritional	−0.45	0.02
30	Demo	White	−0.52	0.01
31	RN Rx	Coping	−0.54	0.09
32	Demo	Male	−0.66	0.00
		R^2	0.064	
		mean	11.03	
		intercept	8.23	

Table 9.26

Regression results as predictors of nursing visits, by total episode: Nursing intervention (RN Rx) home health care components and demographic (Demo) variables

Rank	Type	Variable	Coefficient	P value
1	RN Rx	Wound care	5.86	0.00
2	RN Rx	Metabolic	3.84	0.00
3	RN Rx	Physical regulation	2.55	0.00
4	RN Rx	Urinary elimination	1.84	0.00
5	Demo	Petshome	1.81	0.00
6	RN Rx	Tissue integrity	1.59	0.00
7	Demo	Careself	1.08	0.00
8	Demo	Comprehends	0.84	0.01
9	RN Rx	Sensory	0.68	0.08
10	RN Rx	Coping	0.66	0.20
11	RN Rx	Respiratory	0.58	0.16
12	RN Rx	Skilled observation	0.57	0.04
13	Demo	Married	0.55	0.12
14	RN Rx	Digestive	0.47	0.14
15	Demo	Alone	0.42	0.30
16	RN Rx	Medication	0.37	0.23
17	RN Rx	Fluid volume	0.29	0.42
18	Demo	House	0.09	0.78
19	RN Rx	Cardiac output	0.02	0.96
20	Demo	White	0.01	0.97
21	Demo	Age	−0.02	0.12
22	RN Rx	Tissue perfusion	−0.04	0.90
23	RN Rx	Self-care	−0.04	0.93
24	RN Rx	Nutritional	−0.11	0.73
25	RN Rx	Injury/safety	−0.19	0.59
26	Demo	Male	−0.26	0.39
27	RN Rx	Health behavior	−0.35	0.24
28	RN Rx	Self-concept	−0.60	0.30
29	Demo	Communicates	−0.75	0.06
30	RN Rx	Activity	−0.77	0.02
31	RN Rx	Cognitive	−1.20	0.02
32	RN Rx	Role relationship	−1.53	0.03
		R^2	0.089	
		mean	11.51	
		intercept	7.13	

Table 9.27

Regression results as predictors of all provider visits, by total episode: Nursing intervention (RN Rx) home health care components and demographic (Demo) variables

Rank	Type	Variable	Coefficient	P value
1	RN Rx	Wound care	5.13	0.00
2	RN Rx	Urinary elimination	4.48	0.00
3	RN Rx	Metabolic	4.23	0.00
4	RN Rx	Physical regulation	3.57	0.00
5	RN Rx	Tissue integrity	3.35	0.00
6	RN Rx	Skilled observation	2.06	0.00
7	Demo	Petshome	1.95	0.01
8	Demo	Married	1.40	0.01
9	RN Rx	Health behavior	1.30	0.00
10	RN Rx	Self-care	1.04	0.11
11	Demo	Comprehends	1.01	0.06
12	RN Rx	Digestive	0.95	0.05
13	Demo	House	0.80	0.10
14	RN Rx	Sensory	0.78	0.18
15	Demo	Communicates	0.64	0.31
16	RN Rx	Injury/safety	0.56	0.30
17	RN Rx	Respiratory	0.37	0.56
18	Demo	Careself	0.28	0.62
19	RN Rx	Medication	0.24	0.62
20	RN Rx	Cognitive	0.21	0.80
21	Demo	Alone	0.03	0.96
22	RN Rx	Cardiac output	0.02	0.97
23	Demo	Age	−0.02	0.34
24	RN Rx	Tissue perfusion	−0.36	0.46
25	Demo	White	−0.40	0.45
26	RN Rx	Coping	−0.49	0.54
27	RN Rx	Nutritional	−0.70	0.15
28	RN Rx	Fluid volume	−0.85	0.12
29	RN Rx	Activity	−1.15	0.03
30	Demo	Male	−1.30	0.01
31	RN Rx	Self-concept	−1.39	0.12
32	RN Rx	Role relationship	−2.11	0.05
		R^2	0.068	
		mean	17.93	
		intercept	9.21	

Table 9.28

egression results as predictors of nursing and all provider visits, by first thirty days: Nursing diagnosis (RN Dx) and intervention (RN Rx) home health care components

Nursing visits					All provider visits				
Rank	Type	Variable	Coefficient	P value	Rank	Type	Variable	Coefficient	P value
1	RN Rx	Wound care	2.79	0.00	1	RN Rx	Wound care	2.50	0.00
2	RN Rx	Metabolic	1.40	0.00	2	RN Dx	Self-care	2.14	0.00
3	RN Dx	Tissue integrity	1.38	0.00	3	RN Dx	Role relationship	1.96	0.00
4	RN Rx	Physical regulation	0.69	0.00	4	RN Dx	Activity	1.60	0.00
5	RN Dx	Physical regulation	0.64	0.00	5	RN Dx	Tissue integrity	1.36	0.00
6	RN Rx	Fluid volume	0.53	0.00	6	RN Rx	Metabolic	0.93	0.00
7	RN Dx	Coping	0.53	0.03	7	RN Dx	Metabolic	0.89	0.00
8	RN Dx	Fluid volume	0.45	0.01	8	RN Rx	Skilled observation	0.88	0.00
9	RN Dx	Self-concept	0.42	0.13	9	RN Rx	Digestive	0.77	0.00
10	RN Dx	Metabolic	0.36	0.09	10	RN Rx	Physical regulation	0.77	0.00
11	RN Rx	Self-concept	0.34	0.16	11	RN Rx	Urinary elimination	0.73	0.00
12	RN Dx	Cognitive	0.32	0.01	12	RN Dx	Coping	0.66	0.07
13	RN Rx	Skilled observation	0.26	0.03	13	RN Dx	Sensory	0.48	0.04
14	RN Dx	Medication	0.25	0.34	14	RN Dx	Health behavior	0.48	0.07
15	RN Rx	Respiratory	0.25	0.18	15	RN Dx	Cognitive	0.47	0.01
16	RN Dx	Respiratory	0.25	0.11	16	RN Rx	Tissue integrity	0.45	0.02
17	RN Dx	Digestive	0.24	0.11	17	RN Rx	Health behavior	0.43	0.02
18	RN Dx	Health behavior	0.24	0.19	18	RN Rx	Cognitive	0.43	−0.19
19	RN Rx	Digestive	0.21	0.14	19	RN Dx	Physical regulation	0.42	0.15
20	RN Rx	Urinary elimination	0.20	0.25	20	RN Rx	Respiratory	0.40	0.13
21	RN Dx	Cardiac output	0.19	0.16	21	RN Rx	Fluid volume	0.37	0.09
22	RN Rx	Medication	0.16	0.23	22	RN Dx	Fluid volume	0.28	0.29
23	RN Rx	Tissue perfusion	0.15	0.29	23	RN Dx	Medication	0.24	0.53
24	RN Dx	Sensory	0.09	0.58	24	RN Rx	Medication	0.17	0.38
25	RN Dx	Tissue perfusion	0.05	0.72	25	RN Rx	Self-care	0.14	0.60
26	RN Dx	Role relationship	0.02	0.95	26	RN Dx	Self-concept	0.12	0.75
27	RN Rx	Sensory	0.00	0.98	27	RN Rx	Cardiac output	0.12	0.54
28	RN Dx	Self-care	−0.00	1.00	28	RN Dx	Tissue perfusion	0.11	0.62
29	RN Rx	Nutritional	−0.05	0.69	29	RN Rx	Tissue perfusion	0.01	0.95
30	RN Rx	Cardiac output	−0.05	0.69	30	RN Rx	Self-concept	0.01	0.98
31	RN Rx	Self-care	−0.10	0.59	31	RN Rx	Injury/safety	−0.00	0.99
32	RN Rx	Activity	−0.14	0.35	32	RN Dx	Cardiac output	−0.05	0.79
33	RN Rx	Coping	−0.14	0.54	33	RN Dx	Digestive	−0.09	0.70
34	RN Rx	Tissue integrity	−0.14	0.32	34	RN Rx	Sensory	−0.16	0.51
35	RN Rx	Injury/safety	−0.16	0.27	35	RN Dx	Urinary elimination	−0.23	0.36
36	RN Rx	Health behavior	−0.19	0.13	36	RN Rx	Role relationship	−0.29	0.50
37	RN Dx	Injury/safety	−0.23	0.26	37	RN Dx	Respiratory	−0.32	0.15
38	RN Dx	Nutritional	−0.32	0.05	38	RN Rx	Nutritional	−0.33	0.09
39	RN Dx	Urinary elimination	−0.32	0.07	39	RN Dx	Injury/safety	−0.41	0.16
40	RN Rx	Role relationship	−0.35	0.24	40	RN Rx	Activity	−0.59	0.00
41	RN Rx	Cognitive	−0.37	0.11	41	RN Rx	Coping	−0.75	0.02
42	RN Dx	Activity	−0.53	0.00	42	RN Dx	Nutritional	−0.87	0.00
		R^2		0.121			R^2		0.099
		mean		7.52			mean		11.03
		intercept		5.05			intercept		6.56

Table 9.29

Regression results as predictors of nursing and all provider visits, by total episode: Nursing diagnosis (RN Dx) and intervention (RN Rx) home health care components

Nursing visits					All provider visits				
Rank	Type	Variable	Coefficient	P value	Rank	Type	Variable	Coefficient	P value
1	RN Rx	Wound care	4.68	0.00	1	RN Dx	Metabolic	4.70	0.00
2	RN Rx	Metabolic	3.15	0.00	2	RN Dx	Self-care	4.48	0.00
3	RN Dx	Tissue integrity	2.69	0.00	3	RN Dx	Role relationship	3.98	0.00
4	RN Rx	Physical regulation	2.42	0.00	4	RN Rx	Wound care	3.70	0.00
5	RN Dx	Metabolic	2.25	0.00	5	RN Rx	Urinary elimination	3.56	0.00
6	RN Dx	Physical regulation	1.84	0.00	6	RN Rx	Physical regulation	3.53	0.00
7	RN Rx	Urinary elimination	1.31	0.00	7	RN Dx	Tissue integrity	3.05	0.00
8	RN Dx	Coping	1.01	0.08	8	RN Dx	Activity	2.85	0.00
9	RN Dx	Medication	0.98	0.11	9	RN Rx	Metabolic	2.79	0.00
10	RN Dx	Sensory	0.94	0.01	10	RN Dx	Physical regulation	2.48	0.00
11	RN Dx	Tissue perfusion	0.93	0.01	11	RN Rx	Tissue integrity	2.41	0.00
12	RN Dx	Fluid volume	0.78	0.07	12	RN Rx	Skilled observation	1.88	0.00
13	RN Rx	Tissue integrity	0.77	0.02	13	RN Dx	Medication	1.86	0.05
14	RN Dx	Cardiac output	0.63	0.05	14	RN Dx	Sensory	1.79	0.00
15	RN Rx	Skilled observation	0.58	0.04	15	RN Dx	Tissue perfusion	1.77	0.00
16	RN Dx	Self-concept	0.56	0.38	16	RN Dx	Coping	1.13	0.20
17	RN Dx	Digestive	0.54	0.13	17	RN Dx	Urinary elimination	1.06	0.09
18	RN Rx	Respiratory	0.53	0.22	18	RN Rx	Digestive	1.03	–0.05
19	RN Rx	Coping	0.49	0.35	19	RN Rx	Respiratory	0.81	0.22
20	RN Dx	Respiratory	0.48	0.18	20	RN Rx	Health behavior	0.67	0.13
21	RN Rx	Medication	0.47	0.13	21	RN Dx	Digestive	0.39	0.48
22	RN Dx	Urinary elimination	0.41	0.32	22	RN Dx	Cardiac output	0.37	0.45
23	RN Rx	Digestive	0.34	0.32	23	RN Rx	Self-care	0.34	0.60
24	RN Dx	Health behavior	0.30	0.47	24	RN Rx	Medication	0.32	0.50
25	RN Rx	Sensory	0.30	0.44	25	RN Dx	Health behavior	0.32	0.62
26	RN Dx	Self-care	0.25	0.45	26	RN Rx	Injury/safety	0.30	0.58
27	RN Rx	Fluid volume	0.20	0.57	27	RN Dx	Cognitive	0.26	0.54
28	RN Dx	Cognitive	0.11	0.69	28	RN Rx	Cardiac output	0.15	0.76
29	RN Rx	Cardiac output	–0.02	0.96	29	RN Dx	Fluid volume	0.14	0.83
30	RN Dx	Injury/safety	–0.04	0.94	30	RN Rx	Cognitive	–0.16	0.84
31	RN Rx	Injury/safety	–0.07	0.85	31	RN Dx	Self-concept	–0.23	0.82
32	RN Rx	Nutritional	–0.09	0.78	32	RN Dx	Respiratory	–0.26	0.63
33	RN Dx	Role relationship	–0.10	0.88	33	RN Rx	Sensory	–0.27	0.65
34	RN Rx	Self-care	–0.20	0.64	34	RN Dx	Injury/safety	–0.32	0.66
35	RN Rx	Tissue perfusion	–0.22	0.49	35	RN Rx	Fluid volume	–0.55	0.31
36	RN Dx	Nutritional	–0.26	0.49	36	RN Rx	Nutritional	–0.55	0.25
37	RN Rx	Health behavior	–0.44	0.13	37	RN Rx	Tissue perfusion	–0.61	0.21
38	RN Rx	Self-concept	–0.44	0.44	38	RN Rx	Coping	–0.63	0.42
39	RN Dx	Activity	–0.50	0.08	39	RN Dx	Nutritional	–1.04	0.07
40	RN Rx	Activity	–0.55	0.10	40	RN Rx	Self-concept	–1.16	0.18
41	RN Rx	Cognitive	–1.02	0.05	41	RN Rx	Activity	–1.53	0.00
42	RN Rx	Role relationship	–1.33	0.05	42	RN Rx	Role relationship	–2.06	0.05
		R^2		0.102			R^2		0.096
		mean		11.52			mean		17.93
		intercept		5.04			intercept		6.67

Table 9.30

Regression results as predictors of nursing visits, by first thirty days: Nursing diagnoses (RN Dx), interventions (RN Rx) home health care components, and demographic (Demo) variables

Rank	Type	Variable	Coefficient	P value
1	RN Rx	Wound care	2.70	0.00
2	RN Dx	Tissue integrity	1.42	0.00
3	RN Rx	Metabolic	1.33	0.00
4	Demo	Careself	0.85	0.00
5	RN Rx	Physical regulation	0.72	0.00
6	Demo	Petshome	0.66	0.00
7	RN Dx	Physical regulation	0.62	0.00
8	RN Rx	Fluid voume	0.56	0.00
9	RN Dx	Coping	0.56	0.03
10	Demo	Comprehends	0.55	0.00
11	RN Dx	Fluid volume	0.46	0.01
12	Demo	Married	0.43	0.00
13	RN Dx	Self-concept	0.36	0.18
14	RN Dx	Metabolic	0.34	0.11
15	RN Dx	Cognitive	0.32	0.01
16	RN Rx	Self-concept	0.31	0.21
17	RN Rx	Urinary elimination	0.30	0.08
18	RN Dx	Respiratory	0.29	0.07
19	RN Rx	Skilled observation	0.27	0.03
20	RN Dx	Digestive	0.25	0.10
21	RN Dx	Medication	0.24	0.36
22	RN Rx	Respiratory	0.24	0.21
23	RN Rx	Digestive	0.21	0.15
24	RN Dx	Cardiac output	0.19	0.16
25	RN Rx	Tissue perfusion	0.18	0.19
26	Demo	Alone	0.16	0.36
27	RN Dx	Health behavior	0.15	0.41
28	RN Dx	Role relationship	0.14	0.64
29	RN Rx	Medication	0.08	0.53
30	RN Dx	Sensory	0.08	0.61
31	RN Dx	Self-care	0.06	0.66
32	RN Dx	Tissue perfusion	0.03	0.85
33	RN Rx	Sensory	0.00	0.98
34	Demo	Age	−0.01	0.05
35	RN Rx	Self-care	−0.04	0.83
36	RN Rx	Tissue integrity	−0.05	0.75
37	RN Rx	Nutritional	−0.06	0.64
38	RN Rx	Cardiac output	−0.08	0.58
39	RN Rx	Coping	−0.09	0.69
40	Demo	White	−0.15	0.32
41	RN Rx	Injury/safety	−0.15	0.31

Table 9.30 (cont.)

Regression results as predictors of nursing visits, by first thirty days: Nursing diagnoses (RN Dx), interventions (RN Rx) home health care components, and demographic (Demo) variables

Rank	Type	Variable	Coefficient	P value
42	RN Rx	Activity	−0.15	0.29
43	Demo	Male	−0.18	0.16
44	RN Rx	Health behavior	−0.23	0.07
45	RN Dx	Urinary elimination	−0.25	0.16
46	Demo	House	−0.26	0.06
47	RN Dx	Injury/safety	−0.27	0.19
48	RN Dx	Nutritional	−0.33	0.04
49	RN Rx	Role relationship	−0.34	0.24
50	RN Rx	Cognitive	−0.36	0.12
51	RN Dx	Activity	−0.49	0.00
52	Demo	Communicates	−0.70	0.00
		R^2		0.130
		mean		7.51
		intercept		5.93

Table 9.31

Regression results as predictors of all provider visits, by first thirty days: Nursing diagnoses (RN Dx), interventions (RN Rx) home health care components demographic (Demo) variables

Rank	Type	Variable	Coefficient	P value
1	RN Rx	Wound care	2.49	0.00
2	RN Dx	Self-care	2.16	0.00
3	RN Dx	Role relationship	2.01	0.00
4	RN Dx	Activity	1.63	0.00
5	RN Dx	Tissue integrity	1.39	0.00
6	RN Rx	Skilled observation	0.85	0.00
7	RN Rx	Metabolic	0.83	0.00
8	RN Dx	Metabolic	0.80	0.01
9	RN Rx	Physical regulation	0.79	0.00
10	RN Rx	Digestive	0.76	0.00
11	RN Rx	Urinary elimination	0.73	0.00
12	Demo	Petshome	0.68	0.02
13	Demo	Married	0.68	0.00
14	RN Dx	Coping	0.64	0.08
15	Demo	Comprehends	0.56	0.01
16	Demo	Careself	0.54	0.02
17	RN Dx	Sensory	0.50	0.03
18	RN Dx	Health behavior	0.47	0.07
19	RN Rx	Cognitive	0.45	0.17
20	RN Rx	Tissue integrity	0.44	0.03
21	RN Dx	Cognitive	0.42	0.02
22	RN Dx	Physical regulation	0.41	0.17
23	RN Rx	Health behavior	0.40	0.03
24	RN Rx	Respiratory	0.38	0.16
25	RN Rx	Fluid voume	0.36	0.10
26	RN Dx	Fluid volume	0.28	0.29
27	RN Dx	Medication	0.20	0.59
28	RN Rx	Self-care	0.16	0.55
29	RN Dx	Self-concept	0.13	0.74
30	RN Rx	Cardiac output	0.11	0.56
31	RN Rx	Medication	0.10	0.59
32	RN Dx	Tissue perfusion	0.07	0.76
33	RN Rx	Tissue perfusion	0.06	0.75
34	RN Rx	Injury/safety	0.01	0.96
35	Demo	Age	-0.01	0.56
36	RN Rx	Self-concept	-0.03	0.93
37	RN Dx	Cardiac output	-0.03	0.88
38	RN Rx	Sensory	-0.10	0.68
39	RN Dx	Digestive	-0.13	0.57
40	Demo	House	-0.13	0.51
41	Demo	Alone	-0.16	0.51

Table 9.31 (cont.)

Regression results as predictors of all provider visits, by first thirty days: Nursing diagnoses (RN Dx), interventions (RN Rx) home health care components demographic (Demo) variables

Rank	Type	Variable	Coefficient	P value
42	RN Dx	Respiratory	−0.21	0.34
43	RN Dx	Urinary elimination	−0.24	0.34
44	RN Rx	Role relationship	−0.28	0.51
45	Demo	Communicates	−0.33	0.19
46	RN Rx	Nutritional	−0.34	0.08
47	RN Dx	Injury/safety	−0.43	0.14
48	Demo	Male	−0.53	0.00
49	RN Rx	Activity	−0.56	0.01
50	Demo	White	−0.58	0.01
51	RN Rx	Coping	−0.67	0.04
52	RN Dx	Nutritional	−0.88	0.00
		R^2		0.103
		mean		11.03
		intercept		7.00

Table 9.32

Regression results as predictors of nursing visits, by total episode: Nursing diagnoses (RN Dx), interventions (RN Rx) home health care components, and demographic (Demo) variables

Rank	Type	Variable	Coefficient	P value
1	RN Rx	Wound care	4.58	0.00
2	RN Rx	Metabolic	3.03	0.00
3	RN Dx	Tissue integrity	2.70	0.00
4	RN Rx	Physical regulation	2.43	0.00
5	RN Dx	Metabolic	2.27	0.00
6	RN Dx	Physical regulation	1.78	0.00
7	Demo	Petshome	1.57	0.00
8	RN Rx	Urinary elimination	1.44	0.00
9	Demo	Careself	1.13	0.00
10	RN Dx	Coping	1.08	0.06
11	RN Dx	Sensory	0.97	0.01
12	RN Dx	Medication	0.94	0.13
13	RN Rx	Tissue integrity	0.89	0.01
14	RN Dx	Tissue perfusion	0.86	0.01
15	RN Dx	Fluid volume	0.82	0.06
16	Demo	Comprehends	0.81	0.02
17	Demo	Married	0.63	0.07
18	RN Dx	Cardiac output	0.60	0.06
19	RN Rx	Skilled observation	0.60	0.03
20	Demo	Alone	0.57	0.15
21	RN Dx	Digestive	0.54	0.13
22	RN Dx	Respiratory	0.52	0.15
23	RN Dx	Urinary elimination	0.51	0.21
24	RN Dx	Self-concept	0.51	0.42
25	RN Rx	Respiratory	0.50	0.25
26	RN Rx	Coping	0.49	0.35
27	RN Rx	Medication	0.36	0.25
28	RN Dx	Self-care	0.34	0.31
29	RN Rx	Sensory	0.32	0.42
30	RN Rx	Digestive	0.31	0.37
31	RN Rx	Fluid voume	0.26	0.46
32	RN Dx	Health behavior	0.20	0.64
33	RN Dx	Cognitive	0.16	0.57
34	Demo	House	0.10	0.76
35	RN Rx	Cardiac output	-0.02	0.96
36	Demo	Age	-0.02	0.19
37	RN Dx	Role relationship	-0.03	0.97
38	RN Rx	Injury/safety	-0.03	0.92
39	Demo	White	-0.11	0.75
40	RN Dx	Injury/safety	-0.11	0.81
41	RN Rx	Nutritional	-0.11	0.72

Table 9.32 (cont.)

Regression results as predictors of nursing visits, by total episode: Nursing diagnoses (RN Dx), interventions (RN Rx) home health care components, and demographic (Demo) variables

Rank	Type	Variable	Coefficient	P value
42	RN Rx	Self-care	-0.12	0.78
43	RN Rx	Tissue perfusion	-0.19	0.55
44	Demo	Male	-0.26	0.38
45	RN Dx	Nutritional	-0.29	0.45
46	RN Dx	Activity	-0.44	0.13
47	RN Rx	Self-concept	-0.46	0.42
48	RN Rx	Health behavior	-0.50	0.09
49	RN Rx	Activity	-0.58	0.09
50	Demo	Communicates	-0.82	0.04
51	RN Rx	Cognitive	-1.08	0.04
52	RN Rx	Role relationship	-1.32	0.05
		R^2		0.106
		mean		11.51
		intercept		5.68

Table 9.33

Regression results as predictors of all provider visits, by total episode: Nursing diagnoses (RN Dx), interventions (RN Rx) home health care components, and demographic (Demo) variables

Rank	Type	Variable	Coefficient	P value
1	RN Dx	Metabolic	4.62	0.00
2	RN Dx	Self-care	4.54	0.00
3	RN Dx	Role relationship	3.85	0.00
4	RN Rx	Wound care	3.75	0.00
5	RN Rx	Physical regulation	3.50	0.00
6	RN Rx	Urinary elimination	3.43	0.00
7	RN Dx	Tissue integrity	3.00	0.00
8	RN Dx	Activity	2.92	0.00
9	RN Rx	Metabolic	2.61	0.00
10	RN Dx	Physical regulation	2.40	0.00
11	RN Rx	Tissue integrity	2.32	0.00
12	RN Dx	Sensory	1.89	0.00
13	RN Rx	Skilled observation	1.84	0.00
14	Demo	Petshome	1.79	0.01
15	RN Dx	Tissue perfusion	1.69	0.00
16	RN Dx	Medication	1.68	0.07
17	Demo	Married	1.46	0.01
18	Demo	Comprehends	1.24	0.02
19	RN Dx	Coping	1.11	0.21
20	RN Dx	Urinary elimination	0.98	0.12
21	RN Rx	Digestive	0.94	0.07
22	Demo	Careself	0.84	0.14
23	RN Rx	Respiratory	0.71	0.29
24	Demo	House	0.67	0.17
25	RN Rx	Health behavior	0.65	0.15
26	RN Dx	Cardiac output	0.42	0.39
27	RN Dx	Health behavior	0.35	0.58
28	RN Rx	Injury/safety	0.35	0.52
29	RN Dx	Digestive	0.30	0.58
30	RN Rx	Self-care	0.27	0.68
31	RN Rx	Medication	0.23	0.64
32	RN Rx	Cardiac output	0.22	0.66
33	RN Dx	Cognitive	0.20	0.64
34	RN Dx	Fluid volume	0.19	0.78
35	Demo	Communicates	0.11	0.86
36	Demo	Age	−0.02	0.36
37	Demo	Alone	−0.03	0.96
38	RN Rx	Sensory	−0.09	0.88
39	RN Dx	Respiratory	−0.10	0.86
40	RN Dx	Self-concept	−0.16	0.87
41	RN Rx	Cognitive	−0.28	0.73

Table 9.33 (cont.)

Regression results as predictors of all provider visits, by total episode: Nursing diagnoses (RN Dx), interventions (RN Rx) home health care components, and demographic (Demo) variables

Rank	Type	Variable	Coefficient	P value
42	RN Dx	Injury/safety	−0.36	0.62
43	RN Rx	Tissue perfusion	−0.53	0.28
44	RN Rx	Nutritional	−0.56	0.24
45	RN Rx	Fluid voume	−0.60	0.27
46	Demo	White	−0.63	0.22
47	RN Rx	Coping	−0.64	0.42
48	Demo	Male	−1.06	0.02
49	RN Dx	Nutritional	−1.07	0.06
50	RN Rx	Self-concept	−1.23	0.16
51	RN Rx	Activity	−1.47	0.00
52	RN Rx	Role relationship	−2.00	0.05
		R^2		0.100
		mean		17.93
		intercept		6.11

Figure 9.1

Regression coefficients of nursing and all provider visits, by first thirty days and total episode: Demographic variables

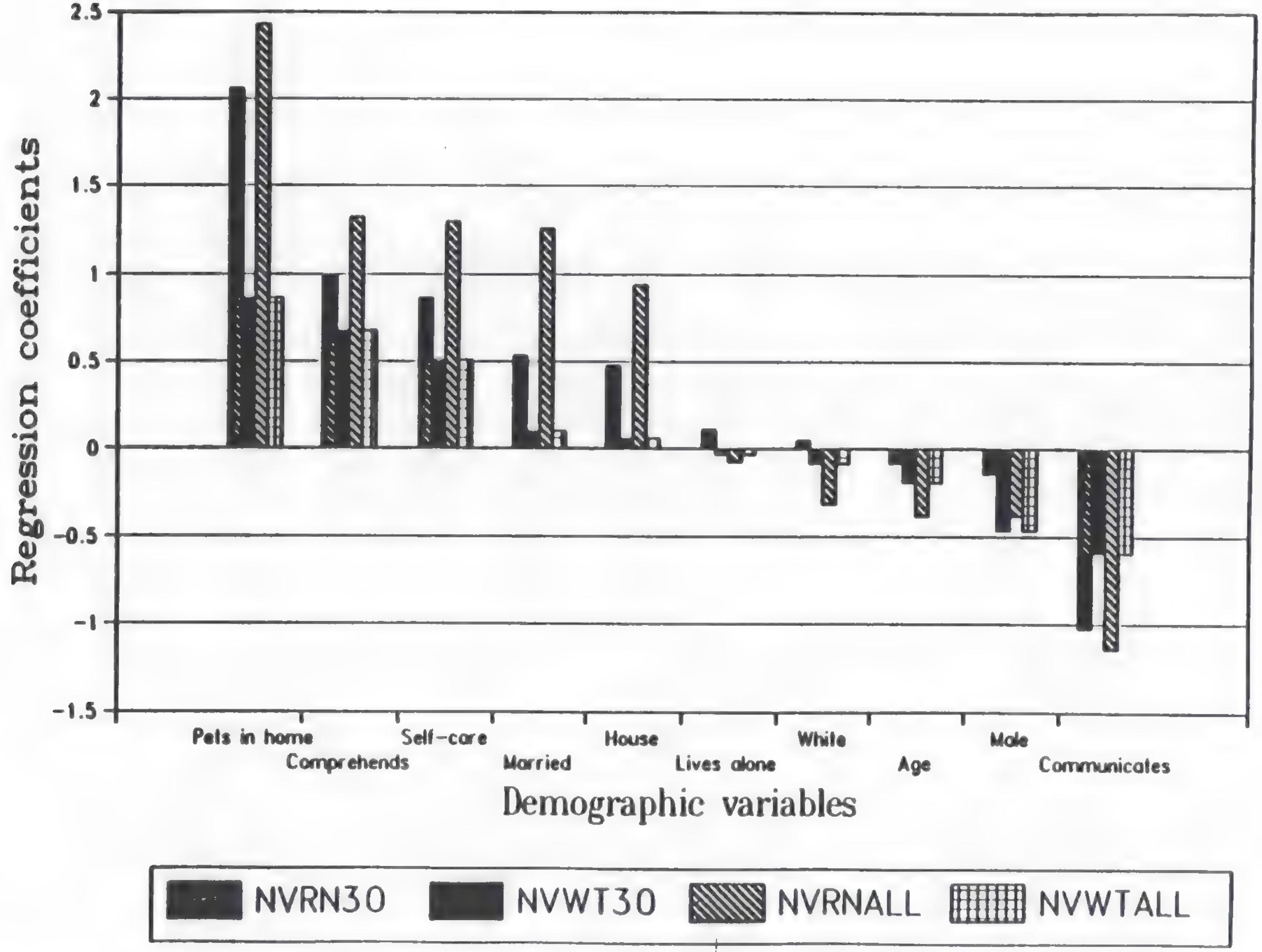


Figure 9.2

Mean nursing and provider visits, by first thirty days and total episode: RUGS activities of daily living

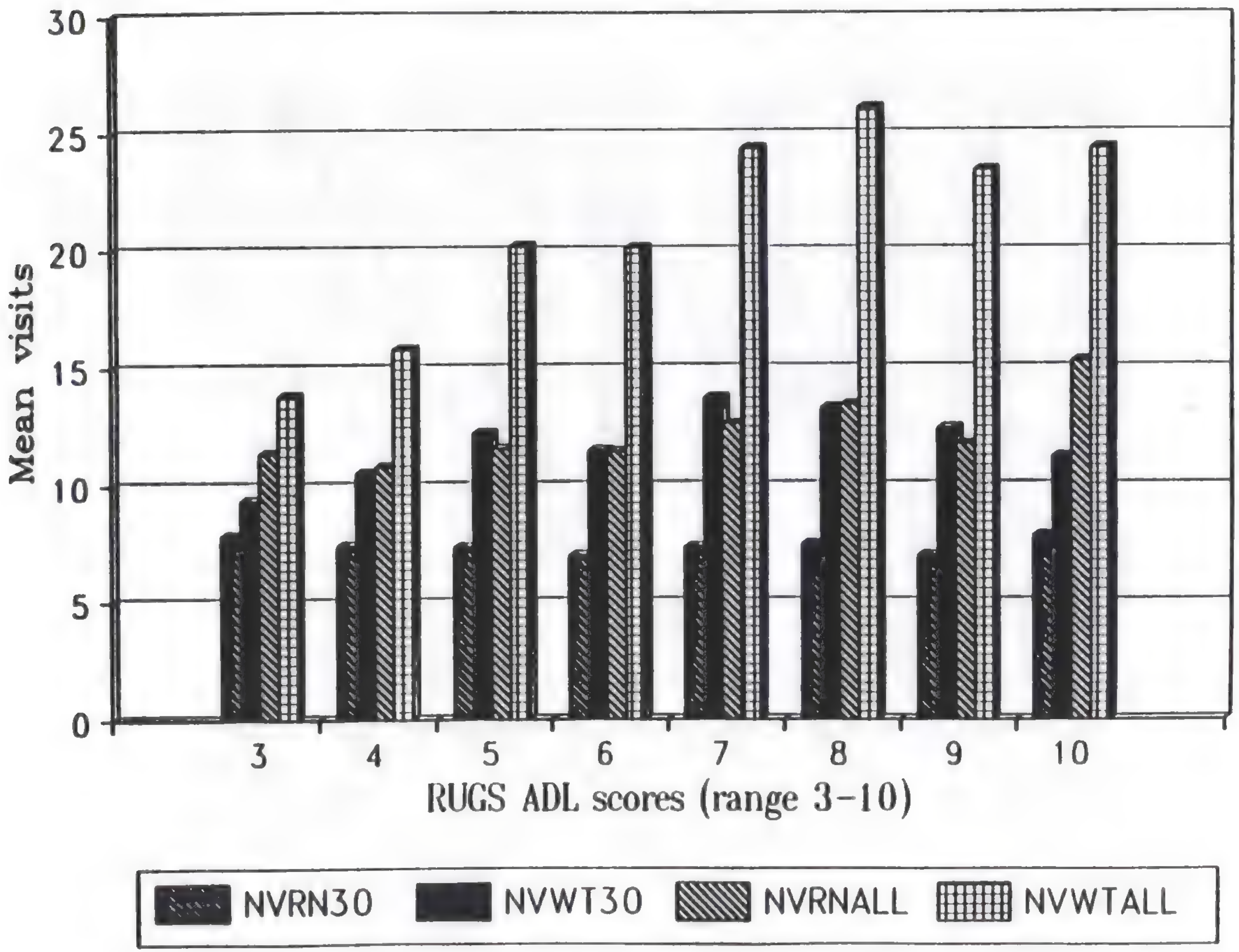


Figure 9.3

Mean nursing and provider visits, by first thirty days and total episode: GU activities of daily living (ADL)

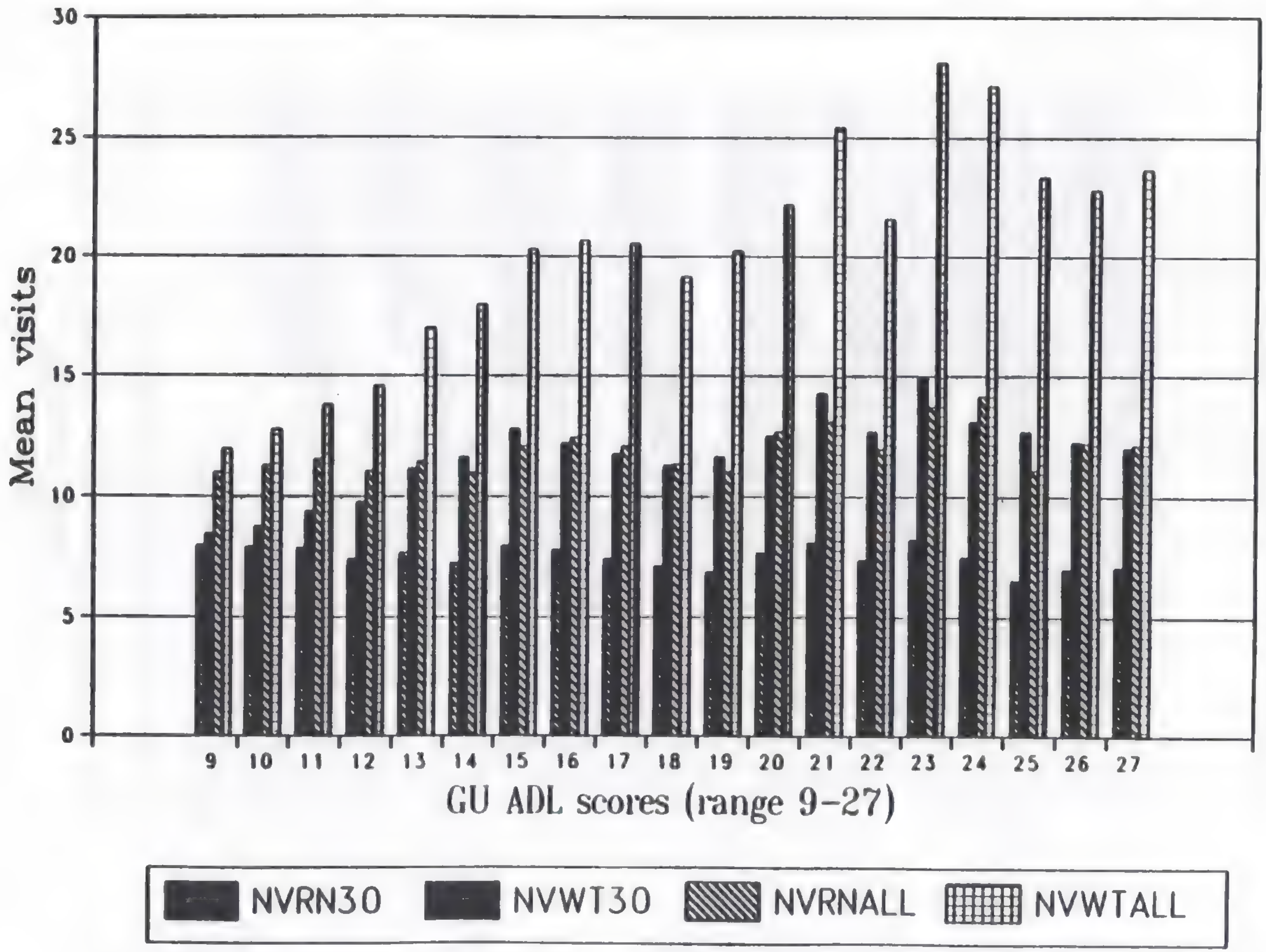


Figure 9.4

Regression coefficients of nursing and all provider visits, by first thirty days and total episode: Nursing diagnosis home health care components

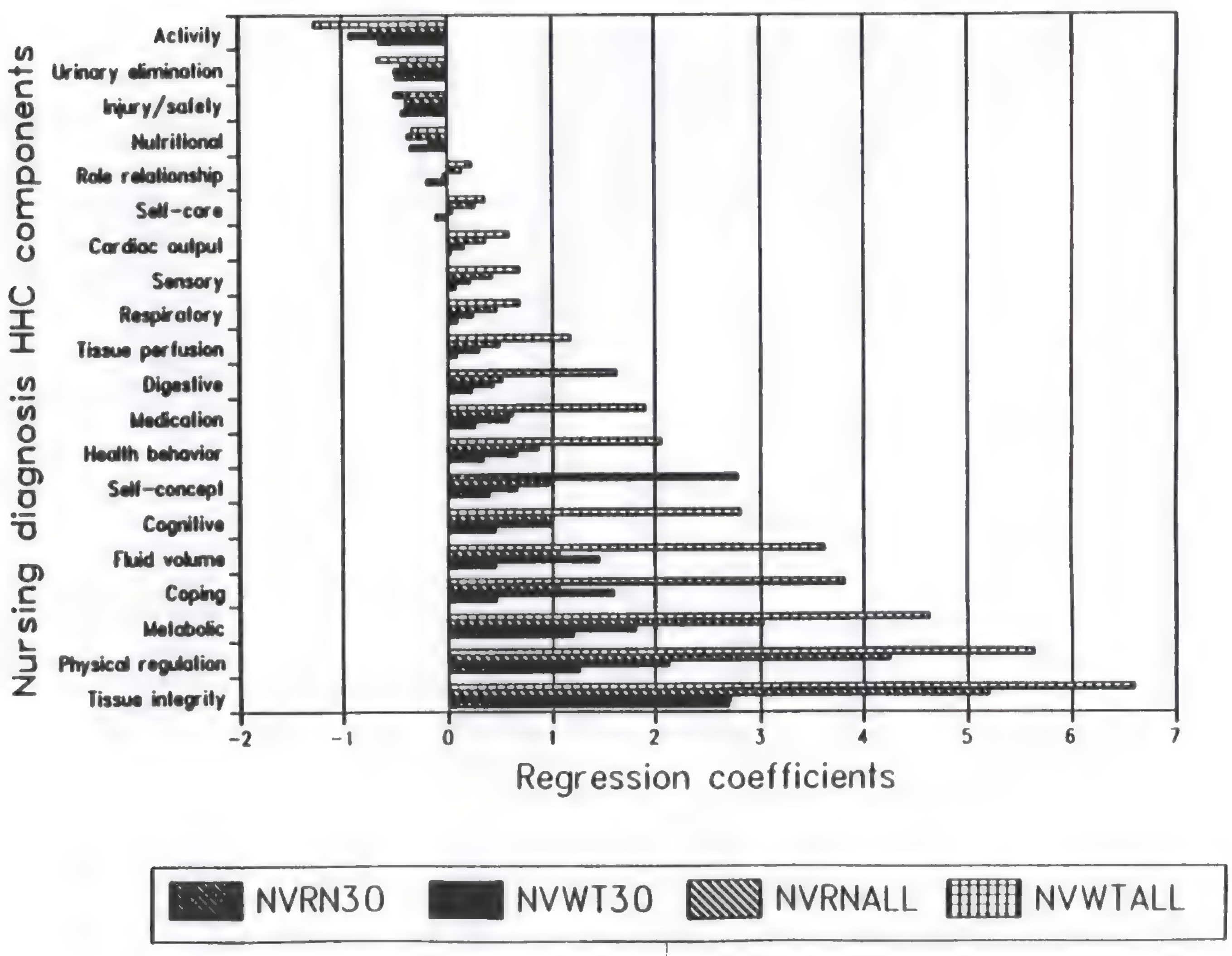


Figure 9.5

Regression coefficients for nursing and all provider visits, by first thirty days and total episode: Nursing intervention home health care components

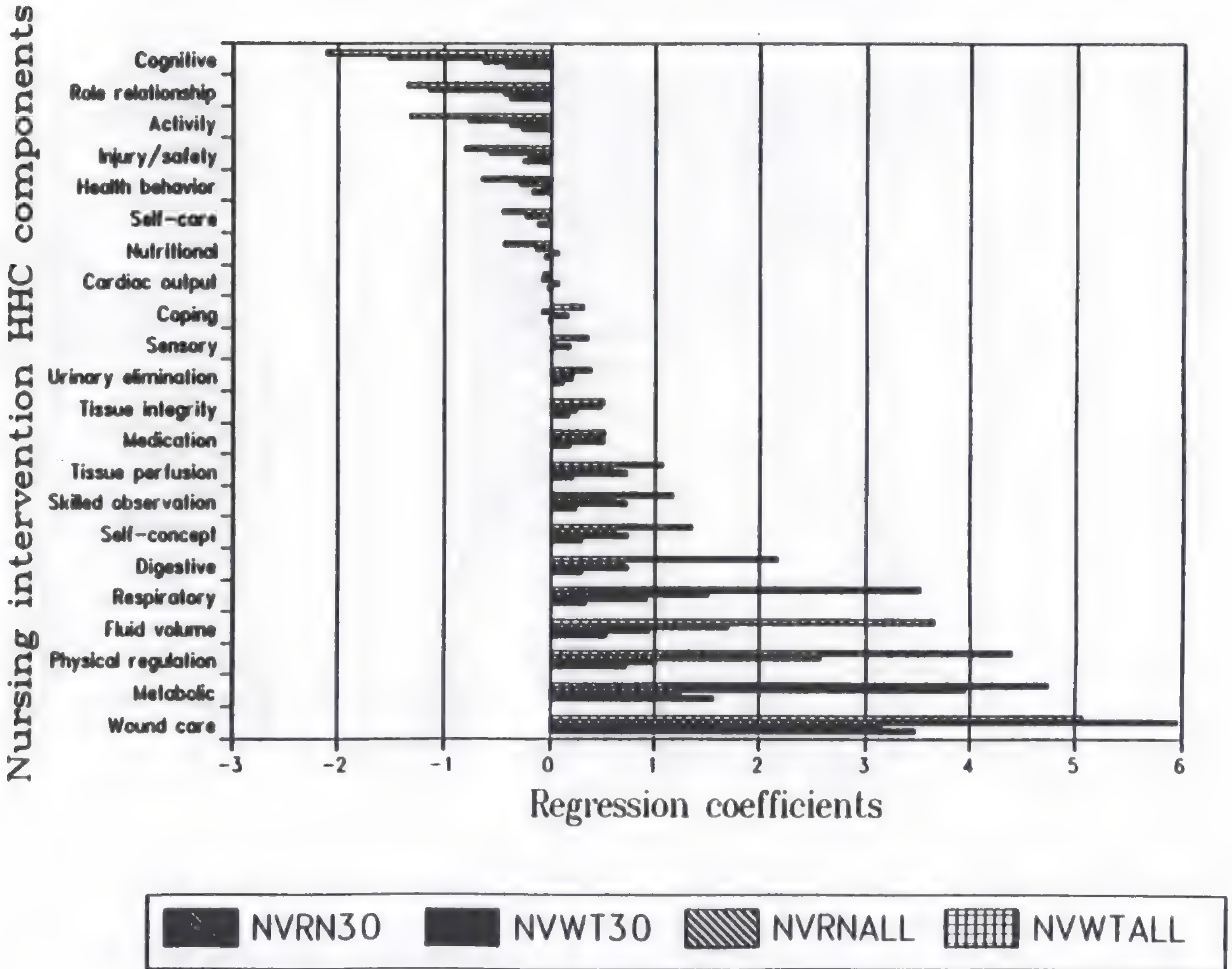
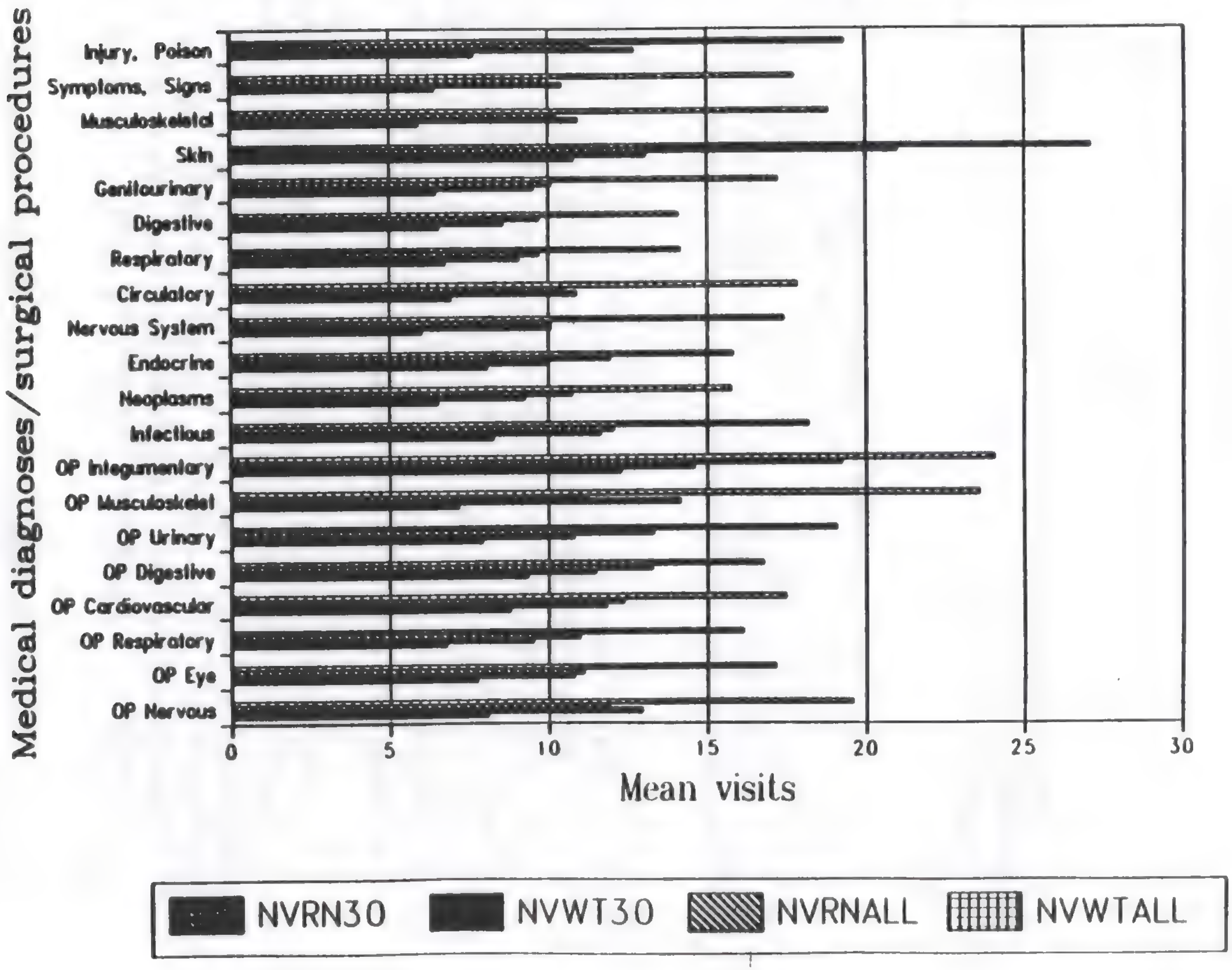


Figure 9.6

Mean nursing and all provider visits, by first thirty days and total episode: Medical diagnoses or surgical procedures



10. COHORT FINDINGS

Cohort Categorical Models

Categorical models were explored to test the effect of the three cohorts on the length of the episodes of care. The cohorts were considered to be a possible approach for classifying home health Medicare patients along with patient characteristics, assessments and services required.

The three cohorts were based on the types of cases and length of episodes in days: (a) short term case (under 30 days), (b) intermediate case (30 to 120 days, and (c) long term case (over 120 days). They were tested on the mean number of nursing and all provider visits for the first thirty (30) days and for the entire episode of home health care. They were the same four dependent variables used in the regression and categorical models.

The cohort models also tested the effect of the three cohorts on the independent variables: (a) ten demographic variables, (b) twenty (20) nursing diagnosis home health care components, (c) twenty-two (22) nursing intervention home health care components, and (d) twenty (20) medical diagnosis or surgical procedure groups. They examined each of the single demographic variables, nursing diagnosis and nursing intervention home health care components, and medical diagnosis or surgical procedure groups independently. This permitted comparisons of each category with the total study cases without the multivariate adjustments for multiple nursing diagnoses or nursing interventions in the same case.

The mean results for cohort one (short term cases) for the first thirty (30) days were extremely significant and far more interesting than those presented for cohorts two and three for the total episode. Cohort one had the same mean results for the first thirty (30) days as for the total episode because the total episode was thirty (30) days or less. Cohorts two and three obviously had higher mean visits because the duration of the episode was longer. However, the most interesting results compared the first thirty (30) days for cohort one to cohorts two and three.

The cohort results suggested fundamental differences between the three cohorts and reinforced the effects of demographics, nursing diagnosis and nursing interventions HHC components, and medical diagnosis or surgical procedure groups previously demonstrated by the regression and categorical models which used multivariate statistics.

Demographic Cohort Categorical Models

The demographic cohort models shown in Tables 10.1 and 10.2 presented the findings which were **easiest** to interpret for nursing visits and all provider visits for first thirty (30) days. Increasing **age** again showed slightly lower visit rates across all cohort classes. **Females** tended to have higher visit rates as did **non-white** and **married** cases. The **primary caregiver** other than self, **unable to communicate** and **comprehends** led to higher number of visits even though they were considered to be barriers to home care. **Pets in the home** and **housing** also had higher visits. The key finding was that these effects were consistent across all cohorts and that the intermediate and long term cases had higher visit rates during the first thirty (30) days.

Nursing Diagnosis Components Cohort Categorical Models

The visit rates by cohort for the twenty (20) nursing diagnosis home health care components are presented in Tables 10.3 and 10.4. Mean visit rates differed consistently by cohort for all categories. **Tissue/skin integrity** component had the highest rates: 6.89, 11.15, and 11.04, for nursing visits in the first thirty (30) days. **Activity** component had the lowest rates 5.56, 8.66, 8.96, of the twenty (20) nursing diagnosis components.

The mean number of nursing visits for all nursing diagnosis components during the first thirty (30) days was more dramatic in cohort one with a very narrow range of mean visits between 5.56 and 6.89, and all provider visits between 7.5 and 9.2. Cohorts two and three had wider ranges for both nursing and all provider visits.

Nursing Intervention Components Cohort Categorical Models

The nursing intervention components shown in Tables 10.5 and 10.6 presented the mean visits by cohort for the twenty-two (22) nursing intervention home health care components. The differences in visits for cohort one versus cohorts two and three in the first thirty (30) days were striking especially for categories such as **wound care**, which had the highest mean number of nursing visits with 7.33 versus 12.27 and 12.71 for cohorts two and three, versus 9.20, 16.94 and 16.61 for all provider visits. Still another was the **Metabolic** component (i.e.diabetic care) with 6.51, 10.34 and 10.96 for nursing visits, versus 8.26, 14.64 and 15.60 for all providers.

The mapping of nursing diagnosis to the nursing intervention components was also significant and worth noting. Both components presented similar findings for nursing visits in the first thirty (30) days for cohort one. These findings were significant enough to be considered as part of the classification method for home health Medicare patients.

Medical Diagnosis or Surgical Procedure Groups Cohort Categorical Models

The results of the twenty (20) medical diagnosis and surgical procedure groups shown in Tables 10.7 and 10.8 had similar patterns. The findings were similar for the three cohorts and the patterns of mean visits were consistent with slightly higher rates in cohorts two and three for all categories even when only the first thirty (30) days were examined.

In several areas, cohort two had higher rates than the long term cases in cohort three, presumably due to rehabilitation and stabilization activities early in the case as contrasted with chronic maintenance care later on. Skin Disease conditions along with operations of the skin, and digestive system operations had the highest mean visits. Also endocrine and infectious diseases had more mean visits across all cohorts.

Cohort Frequencies

In addition to comparing visit rates, the cohort models permitted comparisons of frequency distributions of the demographic variables, nursing diagnosis and intervention home health care components and medical and surgical procedure groups between the three cohorts.

Differences in the characteristics of the three cohorts are key to developing a prospective payment method for classifying cases into cohorts. However, the retrospective data used in this study can only suggest possible differences which must be tested prospectively and through periodic case reassessments.

The visit rates of nursing and all provider visits were compared for each of the three cohorts. The visit rates shown in Table 10.9 underscored the wide disparity between the mean visits in cohort one versus those in cohorts two and three. The lowest visit rates were 5.8 for nursing visits and 7.8 for all provider visits in cohort one.

The most significant findings were the mean number of nursing visits which ranged between 9.3 - 9.2, and 14.3 - 13.7 for all provider visits during the first thirty (30) days for both intermediate and long term cases. These findings identified a significant difference between the short term acute care cases of under thirty (30) days and the intermediate and long term cases over thirty (30) days. They also demonstrated that home health visits could be predicted with a greater level of precision for cohort one than for cohorts two and three. Hence visits for both nursing and all provider were considered to be predictable for the first thirty (30) days with the existing data.

Demographic Cohort Frequencies

The frequency distributions for all provider visits for the demographic variables were indicative of the sample cases. As shown in Table 10.10 the actual numbers, not only changed,

but also the percents changed among the three cohorts. In many variables even though the numbers decreased the percents increased between cohorts. Most of the age groups decreased in numbers and percents except for the percent for the 85 years of age and older group which increased from cohort one to three. On the other hand the percents for married, does not live alone and does not have an available caregiver increased from cohort one to three. These findings revealed that demographics did have a relationship to care requirements.

Nursing Diagnosis and Nursing Intervention Components Cohort Frequencies

The frequency distributions for the twenty (20) nursing diagnosis and twenty (20) two nursing intervention components were the most significant. They both presented similar findings, but because the data were collected retrospectively it was not possible to identify specific differences between cohorts.

As shown in Tables 10.11 and 10.12 the numbers of cases were similar for cohorts one and two and decreased markedly in cohort three. However, there was a wider difference in percents of nursing diagnosis and nursing intervention components between cohort one and cohorts two and three then between cohort two and three. These marked differences again highlighted the high acute care cases being resolved and discharged within the first thirty (30) days.

In general, the majority of nursing diagnosis and intervention components percents increased for the longer cases. This finding further suggested that the long term cases tended to have more nursing diagnoses (patient problems) and required more nursing interventions (care requirements) for the longer episodes of care. However the specific clusters of variables were not feasible to determine in this retrospective study.

Medical Diagnosis or Surgical Procedure Groups Cohort Frequencies

The frequency distributions of the twenty (20) medical diagnosis or surgical procedure groups shown in Table 10.13 indicated that there were little differences between the three cohorts. These findings demonstrated that medical diagnosis or surgical procedure groups were not predictors of length of episode and were weaker when compared with the nursing diagnoses and nursing interventions.

Table 10.1

Mean results of nursing and all provider visits by first thirty days for three cohorts: Demographic variables*

		Nursing visits				All provider visits			
		Cohort				Cohort			
		1	2	3	All	1	2	3	All
Variable	N	Mean	Mean	Mean	Mean	Mean	Mean	Mean	Mean
Age									
<65	705	6.35	11.07	9.52	8.66	7.75	15.74	13.97	11.74
65–69	1017	5.89	10.18	9.71	8.04	7.56	14.69	14.49	11.17
70–74	1698	5.85	9.44	9.49	7.60	7.95	14.54	14.27	11.15
75–79	1877	5.88	8.97	8.89	7.43	8.00	13.94	12.84	10.91
80–84	1663	5.36	8.89	9.37	7.14	7.52	14.27	14.06	10.86
85+	1501	5.57	8.41	8.33	7.02	7.85	13.64	13.23	10.79
Sex									
Female	5221	5.73	9.25	9.36	7.50	7.88	14.40	14.09	11.12
Male	3240	5.79	9.29	8.77	7.53	7.66	14.16	13.10	10.88
Race									
Non-white	1804	5.78	9.19	9.93	7.54	8.23	14.52	14.43	11.37
White	6657	5.75	9.29	8.92	7.50	7.68	14.25	13.51	10.93
Marital status									
Other	4989	5.67	9.23	9.10	7.41	7.66	14.14	13.19	10.78
Married	3472	5.88	9.32	9.16	7.66	8.00	14.55	14.29	11.38
Living arrangements									
Other	5839	5.75	9.04	9.17	7.45	7.86	14.37	14.18	11.20
None	2622	5.76	9.82	9.00	7.64	7.67	14.17	12.31	10.64
Primary caregiver									
Other	6228	5.67	8.88	8.88	7.31	7.85	14.30	13.63	11.09
Self	2233	5.98	10.37	10.05	8.07	7.64	14.33	13.94	10.84
Housing									
Other	2363	5.83	9.66	9.33	7.61	7.92	14.18	13.70	10.84
House	6098	5.72	9.13	9.07	7.47	7.74	14.35	13.70	11.10
Comprehension level									
Able	6229	5.79	9.31	9.48	7.54	7.76	14.11	13.61	10.86
Partially able	1874	5.72	9.16	8.35	7.49	7.97	14.73	14.11	11.53
Unable	358	5.35	9.07	8.47	7.13	7.56	15.48	12.98	11.22
Communication skills									
Able	7066	5.82	9.46	9.38	7.63	7.76	14.19	13.56	10.93
Partially able	1149	5.54	8.33	8.21	6.98	8.25	14.94	14.54	11.69
Unable	246	4.77	8.25	7.92	6.52	6.88	14.70	13.15	10.73
Pets in home									
No	7603	5.74	9.15	8.97	7.43	7.79	14.19	13.51	10.94
Yes	858	5.91	10.25	10.17	8.24	7.81	15.30	14.93	11.82
All	8461	5.75	9.27	9.13	7.51	7.79	14.31	13.70	11.03

* Cohorts: 1 = under 30 days, 2 = 30–120 days, 3 = over 120 days

Table 10.2

Mean results of nursing and all provider visits by total episode for three cohorts: Demographic variables*

		Nursing visits				All provider visits			
		Cohort				Cohort			
		1	2	3	All	1	2	3	All
Variable	N	Mean	Mean	Mean	Mean	Mean	Mean	Mean	Mean
Age									
<65	706	6.35	17.72	34.04	13.96	7.75	26.37	54.04	20.31
65–69	1017	5.89	15.86	37.03	12.27	7.56	24.26	59.89	18.25
70–74	1698	5.85	15.04	33.04	11.36	7.95	24.43	55.29	17.76
75–79	1877	5.88	14.32	34.83	11.47	8.00	23.17	52.10	17.53
80–84	1663	5.36	13.67	34.02	10.77	7.52	23.15	59.48	17.58
85+	1503	5.57	13.32	30.23	10.91	7.85	22.12	54.03	17.75
Sex									
Female	5224	5.73	14.56	34.18	11.47	7.88	23.79	56.58	18.04
Male	3240	5.79	14.73	32.64	11.60	7.66	23.37	53.69	17.78
Race									
Non–white	1804	5.78	14.45	33.81	11.39	8.23	23.97	55.47	18.18
White	6660	5.75	14.67	33.51	11.55	7.68	23.53	55.43	17.88
Marital status									
Other	4992	5.67	14.67	34.17	11.32	7.66	23.47	53.28	17.30
Married	3472	5.88	14.55	32.88	11.80	8.00	23.85	57.98	18.87
Living arrangements									
Other	5840	5.75	14.21	33.26	11.52	7.86	23.75	57.24	18.52
Alone	2624	5.76	15.60	34.45	11.52	7.67	23.32	50.33	16.66
Primary caregiver									
Other	6230	5.67	14.06	32.92	11.34	7.85	23.74	56.03	18.34
Self	2234	5.98	16.22	36.02	12.00	7.64	23.29	53.23	16.82
Housing									
Other	2365	5.83	14.98	32.19	11.11	7.92	22.84	52.01	16.59
House	6099	5.72	14.49	33.98	11.67	7.74	23.91	56.46	18.47
Comprehension level									
Able	6232	5.79	14.66	35.18	11.48	7.76	23.08	54.54	17.34
Partially Able	1874	5.72	14.53	29.38	11.59	7.97	24.97	55.91	19.47
Unable	358	5.35	14.50	32.81	11.72	7.56	25.86	63.55	20.39
Communication Skills									
Able	7069	5.82	14.85	34.65	11.63	7.76	23.21	54.11	17.50
Partially Able	1149	5.54	13.28	28.84	10.83	8.25	25.45	60.03	20.00
Unable	246	4.77	14.39	31.44	11.43	6.88	27.29	62.93	20.96
Pets in home									
No	7606	5.74	14.42	32.96	11.29	7.79	23.40	54.82	17.66
Yes	858	5.91	16.39	37.55	13.49	7.81	25.56	59.47	20.47
All	8464	5.75	14.62	33.57	11.52	7.80	23.63	55.44	17.94

* Cohorts: 1 = under 30 days, 2 = 30–120 days, 3 = over 120 days

Table 10.3

Mean results of nursing and all provider visits by first thirty days for three cohorts: Nursing diagnosis home health care components*

RN Dx Component	Visits: All N	Visits: Cohort N 1	Visits: Cohort N 2	Visits: Cohort N 3	Nursing visits: All Mean	Nursing visits: Cohort means 1	Nursing visits: Cohort means 2	Nursing visits: Cohort means 3	All provider visits: All Mean	All provider visits: Cohort means 1	All provider visits: Cohort means 2	All provider visits: Cohort means 3
Activity	3606	1674	1662	270	7.24	5.56	8.66	8.96	12.21	8.58	15.48	14.62
Cardiac output	2265	1013	1085	167	7.44	5.67	8.74	9.64	10.81	7.65	13.20	14.51
Cognitive	4481	2210	1962	309	7.66	5.82	9.43	9.68	11.40	7.96	14.77	14.62
Coping	533	246	242	45	8.13	5.97	10.09	9.38	12.46	8.50	16.31	13.15
Digestive	1985	962	853	170	7.76	5.96	9.51	9.21	11.60	8.17	14.82	14.85
Fluid	1067	489	477	101	7.96	6.13	9.45	9.77	11.68	8.52	14.43	13.95
Health behavior	1020	499	460	61	7.73	5.84	9.30	11.45	11.77	8.28	15.06	15.19
Injury/safety	788	362	358	68	7.36	5.50	9.09	8.22	11.16	7.71	14.47	12.13
Medication	442	178	214	50	8.03	6.60	8.97	9.14	11.65	8.60	13.65	13.95
Metabolic	949	351	482	116	8.58	6.51	9.74	10.00	12.11	8.39	14.06	15.21
Nutritional	1552	750	670	132	7.51	5.89	9.17	8.23	11.04	7.98	14.13	12.76
Physical regulation	790	356	354	80	8.96	6.25	11.29	10.69	12.35	7.99	16.13	14.94
Respiratory	1885	930	818	137	7.45	5.58	9.33	8.92	10.69	7.52	13.87	13.21
Role relationship	348	132	184	32	7.55	6.00	8.47	8.69	13.89	9.20	17.05	15.08
Self-concept	427	194	197	36	8.09	5.73	10.30	8.64	11.78	7.92	15.41	12.70
Self-care	1933	836	953	144	7.44	5.75	8.79	8.33	13.01	9.17	16.18	14.39
Sensory	1632	774	708	150	7.71	5.96	9.25	9.47	11.91	8.54	15.12	14.20
Tissue perfusion	1635	716	753	166	7.63	5.80	9.17	8.57	11.38	7.69	14.45	13.45
Tissue/skin integrity	3118	1419	1436	263	9.20	6.89	11.15	11.04	12.88	8.92	16.37	15.30
Urinary	1616	728	692	196	7.40	5.64	8.91	8.62	11.70	7.81	15.35	13.29

* Cohorts: 1 = under 30 days, 2 = 30–120 days, 3 = over 120 days

Table 10.4

Mean results of nursing and all provider visits by total episode for three cohorts: Nursing diagnosis home health care components*

RN Dx Component	Visits: All N	Cohort N: 1	Cohort N: 2	Cohort N: 3	Nursing visits: All Mean	Cohort means: 1	Cohort means: 2	Cohort means: 3	All provider visits: All Mean	Cohort means: 1	Cohort means: 2	Cohort means: 3
Activity	3606	1674	1662	270	11.42	5.56	13.79	33.21	20.28	8.58	26.06	57.17
Cardiac output	2265	1013	1085	167	11.74	5.67	13.73	35.63	18.14	7.65	21.61	59.21
Cognitive	4481	2210	1962	309	11.62	5.82	14.63	33.97	18.36	7.96	23.99	56.97
Coping	533	246	242	45	13.23	5.97	16.10	37.51	21.27	8.50	27.07	59.81
Digestive	1985	962	853	170	12.45	5.96	15.33	34.72	19.88	8.17	24.94	60.73
Fluid	1067	489	477	101	12.81	6.13	14.83	35.68	19.69	8.52	23.54	55.63
Health behavior	1020	499	460	61	11.88	5.84	14.86	38.89	18.86	8.28	25.08	58.50
Injury/safety	788	362	358	68	11.81	5.50	14.61	30.65	18.89	7.71	24.14	50.83
Medication	442	178	214	50	13.28	6.60	14.20	33.16	20.96	8.60	22.53	58.25
Metabolic	949	351	482	116	15.40	6.51	16.30	38.50	23.67	8.39	24.35	67.07
Nutritional	1552	750	670	132	11.99	5.89	14.89	31.95	18.64	7.98	23.42	54.92
Physical regulation	790	356	354	80	14.95	6.25	17.61	41.89	22.19	7.99	26.93	64.36
Respiratory	1885	930	818	137	11.56	5.58	14.66	33.70	17.67	7.52	22.75	56.20
Role relationship	348	132	184	32	11.97	6.00	13.61	27.22	24.20	9.20	29.12	57.75
Self-concept	427	194	197	36	12.72	5.73	16.29	30.89	19.34	7.92	25.35	47.98
Self-care	1933	836	953	144	11.81	5.75	14.17	31.41	22.32	9.17	27.71	63.05
Sensory	1632	774	708	150	12.76	5.96	14.83	38.06	20.49	8.54	25.09	60.10
Tissue perfusion	1635	716	753	166	12.63	5.80	14.69	32.78	20.22	7.69	24.28	55.88
Tissue/skin integrity	3118	1419	1436	263	14.94	6.89	18.08	41.28	22.02	8.92	27.60	62.24
Urinary	1616	728	692	196	12.79	5.64	14.48	33.38	21.81	7.81	26.47	57.34

* Cohorts: 1 = under 30 days, 2 = 30–120 days, 3 = over 120 days

Table 10.5

Mean results of nursing and all provider visits by first thirty days for three cohorts: Nursing intervention home health care components*

RN Rx Component	Visits: All N	Visits: Cohort N 1	Visits: Cohort N 2	Visits: Cohort N 3	Nursing visits: All Mean	Nursing visits: Cohort means 1	Nursing visits: Cohort means 2	Nursing visits: Cohort means 3	All provider visits: All Mean	All provider visits: Cohort means 1	All provider visits: Cohort means 2	All provider visits: Cohort means 3
Activity	2332	1116	1055	161	7.44	5.89	8.79	9.32	11.24	8.29	13.94	14.01
Cardiac output	3644	1699	1668	277	7.63	5.96	9.06	9.28	11.36	8.08	14.26	14.05
Cognitive	666	309	312	45	7.08	5.72	8.30	7.87	12.09	8.76	15.16	13.68
Coping	703	338	301	64	7.45	5.86	8.91	8.97	10.84	8.19	13.36	12.96
Digestive	2741	1281	1251	209	7.83	6.08	9.47	8.82	11.94	8.52	15.14	13.79
Fluid	1998	974	875	149	8.07	6.30	9.82	9.28	11.70	8.47	14.97	13.63
Health behavior	4051	1942	1801	308	7.55	5.81	9.13	9.27	11.58	8.26	14.69	14.35
Injury/safety	1906	905	862	139	7.37	5.72	8.81	9.26	11.44	8.08	14.55	14.02
Medication	5123	2448	2291	384	7.63	5.81	9.29	9.38	11.22	7.92	14.29	13.91
Metabolic	1605	667	777	161	8.81	6.51	10.34	10.96	12.09	8.26	14.64	15.60
Nutritional	3961	1915	1755	291	7.67	5.88	9.38	9.19	11.17	7.85	14.41	13.49
Physical regulation	4961	2238	2265	458	7.98	6.07	9.59	9.36	11.57	8.14	14.49	13.94
Respiratory	1165	544	531	90	7.51	5.74	9.08	8.97	11.05	7.88	13.85	13.78
Role relationship	376	193	155	28	7.23	6.09	8.45	8.33	11.50	9.03	14.35	12.81
Self-concept	554	278	245	31	7.72	6.04	9.53	8.42	11.57	8.13	14.96	15.72
Self-care	1116	549	487	80	7.48	5.66	9.29	9.00	11.96	8.40	15.69	13.78
Sensory	1474	714	636	124	7.77	5.84	9.55	9.82	11.61	8.19	14.87	14.61
Tissue perfusion	2652	1244	1193	215	7.80	5.98	9.47	9.11	11.47	8.14	14.51	13.92
Tissue/skin integrity	2782	1233	1284	265	7.96	6.10	9.44	9.48	12.18	8.52	15.21	14.59
Urinary	1898	849	824	225	7.67	5.95	9.23	8.49	12.15	8.45	15.56	13.61
Wound care	2618	1237	1194	187	9.96	7.33	12.27	12.71	13.26	9.20	16.94	16.61
Skilled observation	3398	1642	1536	220	7.61	5.91	9.21	9.18	11.54	8.04	14.89	14.36

* Cohorts: 1 = under 30 days, 2 = 30–120 days, 3 = over 120 days

Table 10.6

Mean results of nursing and all provider visits by total episode for three cohorts: Nursing intervention home health care components*

	Visits				Nursing visits				All provider visits			
	Cohort N				Cohort means				Cohort means			
RN Rx Component	All N	1	2	3	All Mean	1	2	3	All Mean	1	2	3
Activity	2332	1116	1055	161	11.43	5.89	13.95	33.39	18.19	8.29	23.03	55.04
Cognitive	666	309	312	45	10.68	5.72	13.00	28.64	19.38	8.76	24.72	55.26
Coping	703	338	301	64	12.19	5.86	14.67	34.00	18.42	8.19	22.48	53.34
Digestive	2741	1281	1251	209	12.47	6.08	15.34	34.52	20.09	8.52	25.54	58.40
Fluid	1998	974	875	149	12.46	6.30	15.51	34.85	19.04	8.47	24.51	56.04
Health behavior	4051	1942	1801	308	11.77	5.81	14.63	32.58	19.21	8.26	24.63	56.63
Injury/safety	1906	905	862	139	11.53	5.72	14.05	33.73	18.90	8.08	24.06	57.40
Medication	5123	2448	2291	384	11.91	5.81	14.69	34.26	18.47	7.92	23.48	55.87
Metabolic	1605	667	777	161	14.87	6.51	16.71	40.65	21.78	8.26	24.40	65.15
Nutritional	3961	1915	1755	291	11.98	5.88	14.89	34.61	18.49	7.85	23.82	56.33
Physical regulation	4961	2238	2265	458	12.94	6.07	15.35	34.57	19.95	8.14	24.24	56.46
Respiratory	1165	544	531	90	11.65	5.74	14.08	33.06	18.16	7.88	22.35	55.56
Role relationship	376	193	155	28	10.45	6.10	12.98	26.39	17.39	9.03	23.30	42.23
Self-concept	554	278	245	31	11.35	6.04	15.15	28.97	18.33	8.13	25.05	56.70
Self-care	1116	549	487	80	11.93	5.66	15.22	34.90	20.38	8.40	27.06	61.98
Sensory	1474	714	636	124	12.65	5.84	15.19	38.82	19.49	8.19	24.28	59.99
Tissue perfusion	2652	1244	1193	215	12.06	5.98	14.82	31.89	18.82	8.14	23.50	54.68
Tissue/skin integrity	2782	1233	1284	265	13.34	6.10	15.37	37.24	21.63	8.52	25.74	62.67
Urinary	1898	849	824	225	13.10	5.95	15.07	32.90	22.44	8.45	26.58	60.08
Wound care	2618	1237	1194	187	15.81	7.33	19.47	48.57	21.69	9.20	27.61	66.48
Skilled observation	3398	1642	1536	220	11.62	5.91	14.50	34.24	18.81	8.04	24.65	58.50

* Cohorts: 1 = under 30 days, 2 = 30–120 days, 3 = over 30 days

Table 10.7

Mean results of nursing and all provider visits by first thirty days for three cohorts: Medical diagnoses or surgical procedures*

	Nursing visits				All provider visits			
	Cohort				Cohort			
Medical diagnoses/ surgical procedures	1 Mean	2 Mean	3 Mean	All Mean	1 Mean	2 Mean	3 Mean	All Mean
OP Nervous	5.93	10.69	6.80	8.07	9.03	17.01	17.75	12.95
OP Eye	5.67	11.06	9.00	7.74	7.13	16.50	15.92	10.82
OP Respiratory	5.14	8.11	10.33	6.76	6.13	13.20	11.70	9.54
OP Cardiovascular	6.47	10.93	12.06	8.77	8.08	15.42	16.76	11.84
OP Digestive	6.65	12.25	13.23	9.33	7.99	15.47	15.40	11.49
OP Urinary	5.97	10.35	9.23	7.93	7.63	14.65	13.14	10.80
OP Musculoskeletal	5.40	8.20	9.20	7.11	9.83	17.29	16.10	14.13
OP Integumentary	8.98	16.38	16.20	12.31	9.98	20.50	18.70	14.59
Infectious	5.81	11.79	9.10	8.25	7.75	17.20	14.08	11.69
Neoplasms	5.40	8.07	7.21	6.50	7.52	11.95	9.54	9.27
Endocrine	6.31	9.91	8.85	8.04	7.13	12.66	12.73	9.93
Nervous System	4.86	7.26	7.69	6.01	7.50	13.25	11.45	10.05
Circulatory	5.35	8.25	8.51	6.92	7.57	13.59	14.97	10.88
Respiratory	5.43	8.26	7.76	6.74	6.72	11.82	10.42	9.04
Digestive	4.76	9.33	8.20	6.52	5.66	12.87	12.91	8.54
Genitourinary	5.22	8.40	7.21	6.46	6.79	13.29	12.88	9.53
Skin	7.19	13.01	14.30	10.80	8.66	15.54	18.56	13.12
Musculoskeletal	4.77	6.65	11.60	5.92	7.97	13.99	16.92	10.93
Symptoms, Signs	4.98	7.95	6.12	6.40	7.12	13.89	10.29	10.43
Injury, Poison	6.16	8.95	9.82	7.65	9.66	15.70	14.08	12.71
All	5.76	9.30	9.35	7.54	7.82	14.46	13.98	11.14

* Cohorts: 1 = under 30 days, 2 = 30-120 days, 3 = over 120 days

Table 10.8

Mean results of nursing and all provider visits by total episode for three cohorts: Medical diagnoses or surgical procedures*

	Nursing visits				All provider visits			
	Cohort				Cohort			
Medical diagnoses/ surgical procedures	1 Mean	2 Mean	3 Mean	All Mean	1 Mean	2 Mean	3 Mean	All Mean
OP Nervous	5.93	17.22	28.00	11.91	9.03	27.64	60.87	19.58
OP Eye	5.67	16.64	50.67	11.13	7.13	26.53	96.97	17.13
OP Respiratory	5.14	13.38	39.00	10.98	6.13	22.85	47.36	16.11
OP Cardiovascular	6.47	16.44	38.67	12.39	8.08	24.27	53.85	17.44
OP Digestive	6.65	18.27	41.74	13.28	7.99	23.58	53.20	16.78
OP Urinary	5.97	17.15	37.77	13.33	7.63	24.22	59.59	19.04
OP Musculoskeletal	5.40	12.85	33.57	11.21	9.83	29.49	61.51	23.60
OP Integumentary	8.98	27.34	52.93	19.22	9.98	35.70	68.03	24.06
Infectious	5.81	17.65	36.40	12.11	7.75	28.59	50.92	18.20
Neoplasms	5.40	14.41	29.50	10.73	7.52	21.76	43.26	15.74
Endocrine	6.31	15.51	28.10	11.96	7.13	20.53	44.39	15.79
Nervous System	4.86	11.24	43.63	10.08	7.50	21.75	68.90	17.41
Circulatory	5.35	12.94	31.05	10.54	7.57	22.36	59.65	17.81
Respiratory	5.43	12.95	24.24	9.72	6.72	19.38	41.36	14.13
Digestive	4.76	14.54	31.53	9.69	5.66	21.12	58.86	14.12
Genitourinary	5.22	14.04	24.00	10.07	6.79	23.81	53.13	17.25
Skin	7.19	22.44	59.73	21.04	8.66	27.60	83.27	27.08
Musculoskeletal	4.77	11.39	55.10	10.26	7.97	24.37	83.20	18.83
Symptoms, Signs	4.98	12.43	19.79	9.77	7.12	23.08	41.94	17.71
Injury, Poison	6.16	13.87	35.41	11.28	9.66	25.36	54.36	19.32
All	5.76	14.67	34.26	11.58	7.82	23.92	56.24	18.13

* Cohorts: 1 = under 30 days, 2 = 30-120 days, 3 = over 120 days

Table 10.9

Mean nursing and provider visits, by first thirty days and total episode: Three cohorts

Cohort	First thirty days of episode					
	Nursing visits			All provider visits		
	N	Mean	SD	N	Mean	SD
Short term care (under 30 days)	4253	5.76	4.05	4253	7.79	5.66
Intermediate care (30-120 days)	3715	9.28	6.36	3715	14.33	8.66
Long term care (over 120 days)	583	9.15	7.15	583	13.69	7.28

Cohort	Total episode					
	Nursing visits			All provider visits		
	N	Mean	SD	N	Mean	SD
Short term care (under 30 days)	4253	5.76	4.05	4253	7.79	5.66
Intermediate care (30-120 days)	3715	14.64	11.16	3715	23.66	16.50
Long term care (over 120 days)	583	33.66	28.27	583	55.46	38.39

Table 10.10

Frequency distributions of all home visits for cases by three cohorts: Demographic variables*

Demo Variable	Cohort 1 #	2 #	3 #	All #	Cohort 1 %	2 %	3 %	All %
Age								
<65	337	297	72	706	8.0	8.1	12.3	8.3
65-69	500	454	63	1017	11.9	12.4	10.8	12.0
70-74	869	732	97	1698	20.6	19.9	16.6	20.1
75-79	936	816	125	1877	22.2	22.2	21.4	22.2
80-84	837	721	105	1663	19.9	19.6	18.0	19.6
85+	731	651	121	1503	17.4	17.7	20.8	17.8
Sex								
Female	2614	2257	353	5224	62.1	61.5	60.5	61.7
Male	1596	1414	230	3240	37.9	38.5	39.5	38.3
Race								
Non-white	900	786	118	1804	21.4	21.4	20.2	21.3
White	3310	2885	465	6660	78.6	78.6	79.8	78.7
Marital status								
Not married	2542	2135	315	4992	60.4	58.2	54.0	59.0
Married	1668	1536	268	3472	39.6	41.8	46.0	41.0
Lives alone								
No	2831	2578	431	5840	67.2	70.2	73.9	69.0
Yes	1379	1093	152	2624	32.8	29.8	26.1	31.0
Cares for self								
No	3052	2718	460	6230	72.5	74.0	78.9	73.6
Yes	1158	953	123	2234	27.5	26.0	21.1	26.4
Own home								
No	1253	978	134	2365	29.8	26.6	23.0	27.9
Yes	2957	2693	449	6099	70.2	73.4	77.0	72.1
Comprehension level								
Able	3155	2677	400	6232	74.9	72.9	68.6	73.6
Partially able	874	853	147	1874	20.8	23.2	25.2	22.1
Unable	181	141	36	358	4.3	3.8	6.2	4.2
Communication skills								
Able	3537	3068	464	7069	84.0	83.6	79.6	83.5
Partially able	553	502	94	1149	13.1	13.7	16.1	13.6
Unable	120	101	25	246	2.9	2.8	4.3	2.9
Pets in home								
No	3815	3286	505	7606	90.6	89.5	86.6	89.9
Yes	395	385	78	858	9.4	10.5	13.4	10.1
All	4210	3671	583	8464	100.0	100.0	100.0	100.0

* Cohorts: 1 = under 30 days, 2 = 30-120 days, 3 = over 120 days

Table 10.11

Frequency distributions of all home visits for cases by three cohorts: Nursing diagnosis home health care components*

RN Rx Component	Cohort 1 #	Cohort 2 #	Cohort 3 #	Cohort All #	Cohort 1 %	Cohort 2 %	Cohort 3 %	Cohort All %
Activity	1674	1662	270	3606	39.8	45.3	46.3	42.6
Cardiac output	1013	1085	167	2265	24.1	29.6	28.6	26.8
Cognitive	2210	1962	309	4481	52.5	53.4	53.0	52.9
Coping	246	242	45	533	5.8	6.6	7.7	6.3
Digestive	962	853	170	1985	22.9	23.2	29.2	23.5
Fluid	489	477	101	1067	11.6	13.0	17.3	12.6
Health behavior	499	460	61	1020	11.9	12.5	10.5	12.1
Injury/safety	362	358	68	788	8.6	9.8	11.7	9.3
Medication	178	214	50	442	4.2	5.8	8.6	5.2
Metabolic	351	482	116	949	8.3	13.1	19.9	11.2
Nutritional	750	670	132	1552	17.8	18.3	22.6	18.3
Physical regulation	356	354	80	790	8.5	9.6	13.7	9.3
Respiratory	930	818	137	1885	22.1	22.3	23.5	22.3
Role relationship	132	184	32	348	3.1	5.0	5.5	4.1
Self-concept	194	197	36	427	4.6	5.4	6.2	5.0
Self-care	836	953	144	1933	19.9	26.0	24.7	22.8
Sensory	774	708	150	1632	18.4	19.3	25.7	19.3
Tissue perfusion	716	753	166	1635	17.0	20.5	28.5	19.3
Tissue/skin integrity	1419	1436	263	3118	33.7	39.1	45.1	36.8
Urinary	728	692	196	1616	17.3	18.9	33.6	19.1
All	4210	3671	583	8464	100.0	100.0	100.0	100.0

* Cohorts: 1 = under 30 days, 2 = 30-120 days, 3 = over 120 days

Table 10.12

Frequency distributions of all home visits for cases by three cohorts: Nursing intervention home health care components*

RN Rx Component	Cohort 1 #	Cohort 2 #	Cohort 3 #	Cohort All #	Cohort 1 %	Cohort 2 %	Cohort 3 %	Cohort All %
Activity	1116	1055	161	2332	26.5	28.7	27.6	27.6
Cardiac output	1699	1668	277	3644	40.4	45.4	47.5	43.1
Cognitive	309	312	45	666	7.3	8.5	7.7	7.9
Coping	338	301	64	703	8.0	8.2	11.0	8.3
Digestive	1281	1251	209	2741	30.4	34.1	35.8	32.4
Fluid	974	875	149	1998	23.1	23.8	25.6	23.6
Health behavior	1942	1801	308	4051	46.1	49.1	52.8	47.9
Injury/safety	905	862	139	1906	21.5	23.5	23.8	22.5
Medication	2448	2291	384	5123	58.1	62.4	65.9	60.5
Metabolic	667	777	161	1605	15.8	21.2	27.6	19.0
Nutritional	1915	1755	291	3961	45.5	47.8	49.9	46.8
Physical regulation	2238	2265	458	4961	53.2	61.7	78.6	58.6
Respiratory	544	531	90	1165	12.9	14.5	15.4	13.8
Role relationship	193	155	28	376	4.6	4.2	4.8	4.4
Self-concept	278	245	31	554	6.6	6.7	5.3	6.5
Self-care	549	487	80	1116	13.0	13.3	13.7	13.2
Sensory	714	636	124	1474	17.0	17.3	21.3	17.4
Tissue perfusion	1244	1193	215	2652	29.5	32.5	36.9	31.3
Tissue/skin integrity	1233	1284	265	2782	29.3	35.0	45.5	32.9
Urinary	849	824	225	1898	20.2	22.4	38.6	22.4
Wound care	1237	1194	187	2618	29.4	32.5	32.1	30.9
Skilled observation	1642	1536	220	3398	39.0	41.8	37.7	40.1
All	4210	3671	583	8464	100.0	100.0	100.0	100.0

* Cohorts: 1 = under 30 days, 2 = 30-120 days, 3 = over 120 days

Table 10.13

Frequency distributions of all home visits for cases by three cohorts: Medical diagnoses or surgical procedures*

	Cohort				Cohort			
Medical diagnoses/ surgical procedures	1 #	2 #	3 #	All #	1 %	2 %	3 %	All %
OP Nervous	57	49	5	111	1.4	1.4	0.9	1.4
OP Eye	55	33	3	91	1.4	1.0	0.6	1.1
OP Respiratory	66	56	9	131	1.7	1.6	1.7	1.6
OP Cardiovascular	222	208	18	448	5.6	6.0	3.3	5.6
OP Digestive	327	257	31	615	8.3	7.4	5.7	7.7
OP Urinary	68	48	13	129	1.7	1.4	2.4	1.6
OP Musculoskeletal	274	345	46	665	6.9	9.9	8.5	8.4
OP Integumentary	108	74	15	197	2.7	2.1	2.8	2.5
Infectious	93	62	10	165	2.4	1.8	1.8	2.1
Neoplasms	237	150	38	425	6.0	4.3	7.0	5.3
Endocrine	257	222	41	520	6.5	6.4	7.6	6.5
Nervous System	123	91	16	230	3.1	2.6	3.0	2.9
Circulatory	880	895	118	1893	22.3	25.8	21.8	23.8
Respiratory	310	241	38	589	7.9	6.9	7.0	7.4
Digestive	149	84	15	248	3.8	2.4	2.8	3.1
Genitourinary	101	57	19	177	2.6	1.6	3.5	2.2
Skin	104	117	33	254	2.6	3.4	6.1	3.2
Musculoskeletal	97	74	10	181	2.5	2.1	1.8	2.3
Symptoms, Signs	152	146	34	332	3.9	4.2	6.3	4.2
Injury, Poison	267	259	29	555	6.8	7.5	5.4	7.0
All	3947	3468	541	7956	100.0	100.0	100.0	100.0

* Cohorts: 1 = under 30 days, 2 = 30-120 days, 3 = over 120 days

11. HOME HEALTH CARE CLASSIFICATION METHOD

Overview

A preliminary Home Health Care (HHC) Classification System is being proposed that can predict resource requirements and measure outcomes of care for home health Medicare patients. This method combines two types of variables: (a) length of the episode of home health care, and (b) nursing care requirements of a patient.

Background

The Home Health Care Classification Method emerged from the findings of this research. The study identified that the length of the episodes of home health care for fifty percent of the sample cases was under thirty (30) days and the remainder ranged from thirty (30) to over one hundred twenty (120) days. The analysis of the nursing visit data also identified that there was a wide disparity between the 5.8 mean number nursing visits provided during the first thirty (30) days of care and the 9.3 mean visits for the first thirty (30) days for those cases whose episodes were longer than thirty (30) days.

Those with episodes of under thirty (30) days appeared to be acute care cases and needed intense care by multiple providers. They were generally early hospital discharges and had conditions such as surgical procedures or post acute medical conditions that required specific nursing interventions.

The longer cases fell into two cohorts: intermediate and long term care. They were cases that were not as easy to evaluate from retrospective data. Based on professional knowledge, it seemed that the intermediate cases were being rehabilitated or stabilized and required longer skilled nursing services than thirty (30) days including the management, referral and teaching of care. The long term care cases needed continued skilled nursing and other services which were assumed to be those of the home health aide. They were cases with chronic conditions needing continued monitoring and supervision of their care.

There was also a group of patients who deteriorated and died at home, were re-admitted to the hospital, referred to a skilled care facility, or to a terminal care program. This group did not have any consistent pattern for either the length of episode or nursing care requirements. It was assumed that this type case could occur at any time during an episode of care.

Classification Method Framework

Based on the study findings a clinically sound and statistically significant Home Health Care Classification Method was developed. The method uses a framework that encompasses two types of data: (a) length of the episode which consists of three cohorts based on the length of the episode in days, and (b) the nursing care requirements of the patient which consists of at least three levels of care for each of the three cohorts. The nursing care requirements are based on nursing assessment, nursing diagnoses, nursing interventions and other care requirements needed to provide the expected outcome goals.

Length of Episode

The length of the episode consists of three cohorts: (a) short term cases of under 30 days, (b) intermediate cases of 30 to 120 days, and (c) long term cases of over 120 days requiring home health care. The determination of initial placement into a cohort is based on the professional judgment of the admitting nurse and is considered to be a provisional prediction.

Nursing Care Requirements

The nursing care requirements of patients for each of the three cohorts are based on five types of assessment data: (a) ten demographic variables, (b) twenty (20) nursing diagnosis home health care components, (c) measures of outcomes identified by three discharge status goals, (d) twenty (20) nursing intervention home health care components, and (e) four types of nursing interventions. The twenty-two (22) nursing intervention components were restructured to match the twenty (20) home nursing diagnosis components.

The twenty (20) home health care components along with the demographic variables are designed to not only assess the patients on admission to home health care, but also to reassess patients at thirty (30) or sixty (60) day intervals and other predetermined times. The patients are scored for three levels of care for each of the three types of cohorts. The regression coefficients are used to weight and score the patients and predict the average number of home visits.

Assessment Instrument

The Assessment Instrument shown in Figure 11.1 is an instrument that is used to assess and classify a patient. It includes the instructions, definitions, and coding schemes needed to assess the nursing care requirements of a patient. The major coding schemes used are listedin Figure 11.2. They are supplemented by two lists (dictionaries) for the nursing diagnoses and nursing interventions (Appendix 6.1) which are used to identify the specific data elements for each list.

The major coding schemes include:

- **Home Health Care Components**: List of twenty (20).
- **Nursing Diagnoses**: List of one hundred forty-seven (147) nursing diagnoses (Appendix 6.1).
- **Discharge Status**: Three discharge statuses for each nursing diagnosis as measures of expected outcomes.
- **Nursing Interventions**: List of one hundred sixty-six (166) nursing interventions (Appendix 6.1).
- **Nursing Types**: Four types of nursing intervention actions.
- **Medical Diagnosis or Surgical Procedure Groups**: List of twenty (20).
- **Demographic Variables**: List of ten.

Admission Cohort Placement

On admission to home health care each case is placed into one of three cohorts by the admitting nurse:

- Cohort 1: Short term care - under 30 days
- Cohort 2: Intermediate care - 30 to 120 days
- Cohort 3: Long term care - over 120 days

Placement is based on the professional judgement of the admitting nurse and considered at this time to be a provisional prediction. The nurse determines if a patient is either: (a) acute care case which will be resolved during the first thirty days or (b) intermediate or long term case requiring over thirty (30) days of skilled nursing care for rehabilitation, stabilization or chronic care management. Figure 11.3 illustrates the pathways of the classification method process.

Based on this research, only the levels of care scores for the three cohorts for the first thirty (30) days can be validated by the study findings. Further research is needed to refine and validate the levels of care scores for the intermediate care and long term care.

Nursing Care Requirements

Next, the nursing care requirements for each of the twenty (20) components of home health care components are assessed. The specific: (a) nursing diagnoses, (b) discharge statuses, (c) nursing interventions, and (d) types of nursing actions are identified for each of the components that link nursing diagnoses and nursing interventions together. They also provide the framework for identifying the data elements used to score the levels of care for each od the three cohorts.

Home Health Care Component Scores

The assessed data elements for each of the home health care components are scored based on their nursing care requirement coefficients. The resulting values are assigned and used to determine at least three levels of care for each of the three cohorts. They are unique weights used to predict resource requirements in terms of number of visits. The weights for the short term acute care cases for the first thirty (30) days will be different than those for the intermediate or long term care cases.

Demographic Variables

The ten demographic variables are also scored. They function in a similar manner to the twenty (20) components of home health care components. They contribute additional weights for each cohort to predict individualized scores for each cohort.

Re-assessment Intervals

Patients are re-assessed and re-classified at thirty (30) or sixty (60) day intervals or when their health statuses change, i.e new medical conditions, surgical procedure, or hospitalization occurs during the episode.

Classification Method Example

An example of how the home health classification method would be used including the possible pathways for each cohort is described below and illustrated in Figure 11.3.

Cohort One

A patient on admission will be placed by the admitting nurse into cohort one which consists of two pathways: (a) a short term acute care case which will be resolved within thirty (30) days, or (b) an intermediate or long term patient which will take longer than thirty (30) days to resolve. The placement is based on professional judgement and considered to be a provisional prediction.

The admitting nurse completes the Assessment Instrument: (a) identifies the specific nursing data elements for each of the twenty (20) home health care components, and (b) ten demographic variables. The variables are scored and used to verify the placement of the patient into either of the two cohorts (under or over thirty (30) days). Based on the scores and cohort placement the patient is classified into one of three levels of care and assigned the average number of home visits.

Cohort Two

At the end of the first thirty (30) days, a patient who was not discharged is reassessed using the Assessment Instrument. The variables are scored and used to verify the placement of the patient into either of the two cohorts over thirty (30) days. Based on the scores and cohort placement the patient is reclassified into one of three levels of care and again are assigned the average number of home visits.

Cohort two consists of two pathways: (a) an intermediate care patient who still needs skilled care to be rehabilitated or stabilized and whose condition should be resolved within thirty (30) or sixty (60) additional days, or (b) a long term care patient who continues to need skilled nursing care and whose duration of home health care is not possible to determine.

Cohort Three

At the end of the second thirty (30) or sixty (60) days a patient who was not discharged is again reassessed using the Assessment Instrument. At that time the patient who was not discharged remains in cohort two or gets placed in cohort three. The variables are scored and used to verify the placement of the patient into either of the two cohorts. Based on the scores and cohort placement the patient is reclassified into one of three levels of care and assigned the average number of home visits.

Cohort three also consists of two pathways: (a) an intermediate care patient who still needs home health care to be rehabilitated or stabilized and whose condition should be resolved within another thirty (30) additional days, or (b) a long term care patient who will require monitoring and continued care for at least thirty (30) or sixty (60) additional days.

Exceptions

When the status of a patient changes, i.e have a new medical condition, hospitalized during the episode etc. the patient is reassessed and reclassified using the above process. However, those patients who deteriorate may die at home, be re-admitted to the hospital, referred to a skilled care facility and transferred to a terminal or special long term care program are treated like other discharged patients.

Classification Method Coding Schemes

The coding schemes developed for this research were used for the classification method. They include: (a) nursing diagnoses, (b) discharge statuses, (c) nursing interventions, and (d) types of nursing actions. These were used to identify the nursing care requirements of patients for home health care.

In addition the scheme of twenty (20) home health care components was developed to provide a framework for identifying the specific nursing diagnoses and nursing interventions used to assess and classify the patients. This scheme which is critical to the classification method, links the nursing diagnoses and nursing interventions together. It is also used to score the three levels of care for each of the three cohorts.

In summary, the Home Health Care Classification Method with the Assessment Instrument has potential for reimbursement of home health care and could form the basis for a prospective payment system for the home health care industry. Additionally the newly developed coding schemes could be used for more efficient documentation of the home health care, for other research studies, and for the design of home health care computer systems.

Figure 11.1

PRELIMINARY HOME HEALTH CARE CLASSIFICATION METHOD
Assessment Instrument

Home health care component	Nursing diagnosis (enter multiple codes/names)	Discharge status goal*			Nursing intervention (enter multiple codes/names)	Type nursing action**				Cohort 1 score Level of care			Cohort 2 score Level of care			Cohort 3 score Level of care		
		I	S	D		A	C	T	M	1	2	3	1	2	3	1	2	3
1. Activity																		
2. Cardiac output																		
3. Cognitive																		
4. Coping																		
5. Digestive																		
6. Fluid																		
7. Health behavior																		
8. Injury/safety																		
9. Medication																		
10. Metabolic																		
11. Nutritional																		
12. Physical regulation																		
13. Respiratory																		
14. Role relationship																		
15. Self-concept																		
16. Self-care																		
17. Sensory																		
18. Tissue perfusion																		
19. Tissue/skin integrity																		
20. Urinary																		

* I = Improved, S = Stabilized, D = Deteriorated
** A = Assess, C = Direct care, T = Teach, M = Manage

Figure 11.1 (cont.)

PRELIMINARY HOME HEALTH CARE CLASSIFICATION METHOD
Assessment Instrument

Demographic variable	Yes	No	Cohort 1 score			Cohort 2 score			Cohort 3 score		
			Level of care			Level of care			Level of care		
			1	2	3	1	2	3	1	2	3
1. Age											
2. Male											
3. White											
4. Married											
5. Lives alone											
6. Self-care											
7. House											
8. Comprehends											
9. Communicates											
10. Pets in home											

Figure 11.2

HOME HEALTH CARE CLASSIFICATION METHOD
Coding Schemes

A. **Home Health Care Components for Nursing Diagnoses and Nursing Interventions**

1. Activity
2. Cardiac output
3. Cognitive
4. Coping
5. Digestive
6. Fluid
7. Health behavior
8. Injury/safety
9. Medication
10. Metabolic
11. Nutritional
12. Physical regulation
13. Respiratory
14. Role relationship
15. Self-concept
16. Self-care
17. Sensory
18. Tissue perfusion
19. Tissue/skin integrity
20. Urinary

B. **Nursing Diagnoses Discharge Statuses**

1. Resolved/improved
2. No change/stabilized
3. Worse/deteriorated

C. **Types of Nursing Interventions**

1. Assess
2. Direct Care
3. Teach
4. Manage

Figure 11.2 (cont.)

HOME HEALTH CARE CLASSIFICATION METHOD
Coding Schemes

D. **Medical Diagnoses or Surgical Procedures**

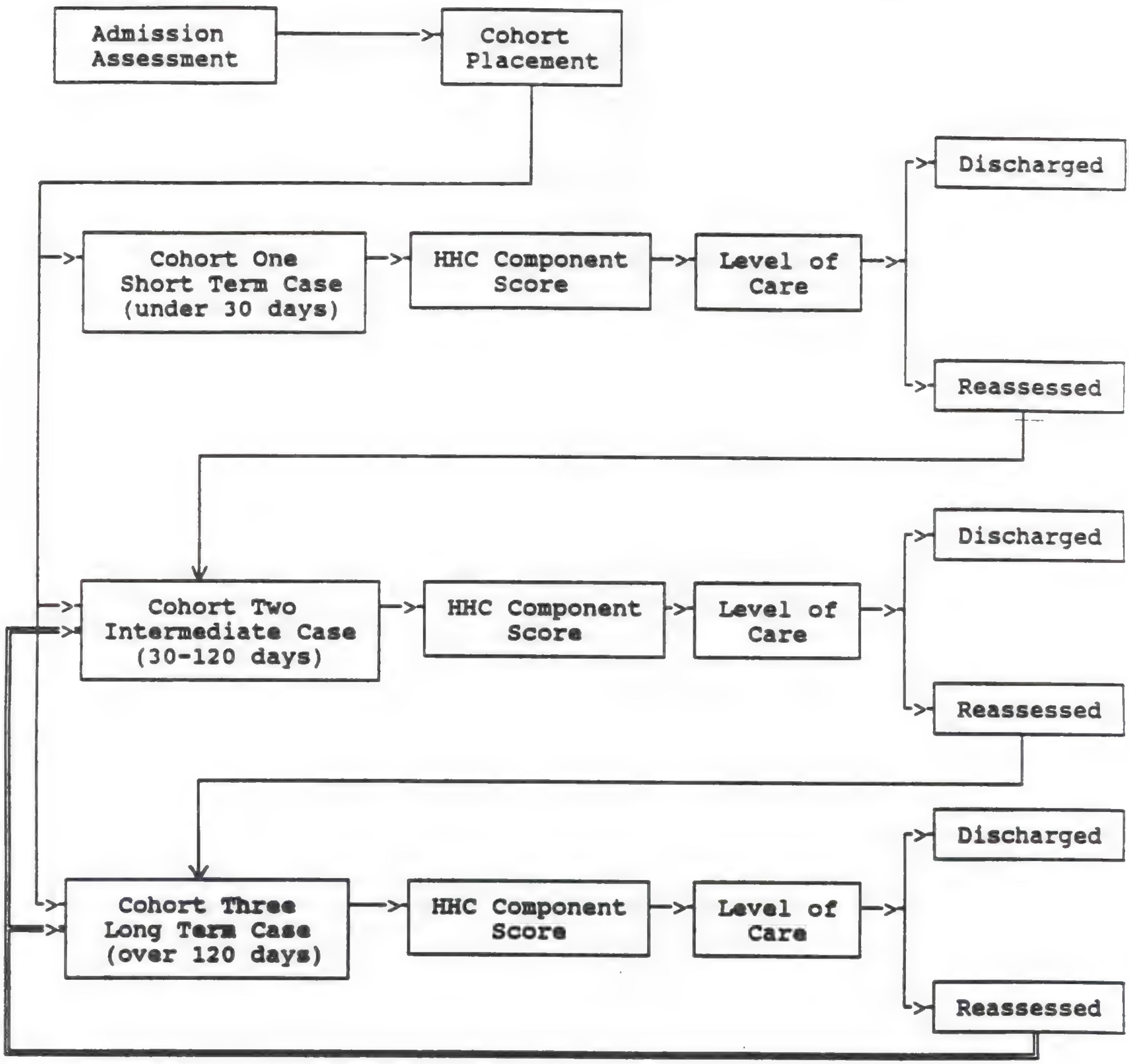
1. Operations: Nervous
2. Operations: Eye
3. Operations: Respiratory
4. Operations: Cardiovascular
5. Operations: Digestive
6. Operations: Urinary
7. Operations: Musculoskeletal
8. Operations: Integumentary
9. Infectious
10. Neoplasms
11. Endocrine
12. Nervous system
13. Circulatory
14. Respiratory
15. Digestive
16. Genitourinary
17. Skin
18. Musculoskeletal
19. Symptoms, signs
20. Injury, poison

E. **Demographic Variables**

1. Age
2. Male
3. White
4. Married
5. Lives alone
6. Self-care
7. House
8. Comprehends
9. Communicates
10. Pets in home

Figure 11.3

Home health care classification method example



12. SUMMARY

The significant findings described in this report provide a comprehensive understanding of this increasingly important health care delivery setting. They expand the information base needed for future Medicare policy decisions concerning home health services.

The findings, which are highly reliable, are based on a very large database which represents one of the largest collection of pertinent information collected on home health Medicare patients. The database consists of almost 9,000 patient records of cases with recent episodes of home health care. They were collected from a stratified national sample of 646 Medicare certified home health agencies.

This section summarizes the conclusions, limitations and recommendations based on this research. The findings led to four major conclusions, several outcomes and products. The limitations of the research project are also outlined and highlighted including the major problems encountered with the analysis of the data. Finally, the recommendations are provided including possible next steps.

Conclusions

Four major conclusions were derived from this research project. They address the objectives of the project which were to determine the variables critical for predicting resource requirements and measuring outcomes of home health care, and underscore their results. They focus on: (a) descriptive findings, (b) predictive findings, (c) cohort findings, and (d) the preliminary home health care classification method.

Descriptive Findings

The descriptive analysis strongly suggests that home health care for Medicare patients in this country is efficient and effective. Home health programs are administered by certified home health agencies that vary by staff size and type of ownership, and are found in all geographic locations. The HHAs offer an array of home health services with the major service being skilled nursing care. Home health nurses not only give nursing care but also manage the care of patients provided by a mix of other providers.

The Medicare patients being served are predominantly elderly, white, middle class females, married or widowed, living in their own homes with an available caregiver. Poor, disadvantaged, high risk patients were not represented among the sample patients. It is assumed that they are not served by home health agencies to any significant extent and may be cared for in skilled nursing facilities or similar types of institutions, or not served at all.

Predictive Findings

The predictive analyses demonstrated that home health care can be predicted reliably and that a home health classification method is feasible. The analyses identified that the most predictive measures of resource requirements were based on the length of the episode and the nursing care requirements of the patient.

The predictive analyses determined that the best method for predicting home health care requirements are based on the nursing diagnosis and nursing intervention home health care components. These are better predictors than functional status, medical diagnosis or surgical procedure. Demographics do have an impact on resource requirements and selected ones can be used to improve predictions when used in combination with nursing diagnosis or nursing intervention components.

Cohort Findings

The length of the episodes of care was determined to be highly significant. Almost fifty percent of all patients had episodes of under thirty (30) days duration, whereas the remaining fifty percent represented other patterns of episodes of care.

These findings led to the development of the three cohorts based on the length of the episode in days: (a) short term, acute care cases of under 30 days, (b) intermediate care cases of 30 to 120 days, and (c) long term, chronic care cases of over 120 days. The number of visits during the first thirty (30) days was significantly lower for the short term acute care cases than for the intermediate or long term cases.

Home Health Care Classification Method

A preliminary Home Health Care Classification Method, based on the findings of this research was developed. It combines the length of the episode, using the three cohorts based on the length of the episode in days, with nursing care requirements of a patient.

The length of the episode consists of three cohorts: (a) short term cases of under 30 days, (b) intermediate cases of 30 to 120 days, and (c) long term cases of over 120 days requiring home health care.

The nursing care requirements for each of the three cohorts are based on five types of assessment data: (a) ten demographic variables, (b) twenty (20) nursing diagnosis home health care components, (c) measures of outcomes identified by three discharge status goals, (d) twenty (20) nursing intervention home health care components, and (e) four types of nursing intervention actions.

The classification method requires a specially designed Assessment Instrument which is used to assess, classify and predict the care requirements in terms of numbers of home visits. Patients, on admission to home health care, are placed into one of three cohorts: (a) short term case, (b) intermediate case, or (c) long term case. They are assessed using the twenty (20) home health care components scheme to identify nursing diagnoses, discharge statuses expected outcomes, nursing interventions, and types of nursing actions. They are then scored for three levels of care for each of the three cohorts. The scores will serve to predict the average number of home visits required.

Home Health Care Tools

This research also produced several tools for the home health care industry. They include the schemes that were specifically developed to code and analyze the narrative descriptions for: (a) ten demographic variables, (b) list of one hundred forty-seven (147) nursing diagnoses, (c) list of three discharge statuses as measures of expected outcomes, (d) list of one hundred sixty-six (166) nursing interventions, and (e) list of four types of nursing actions. These schemes were found to be the most useful classification variables that predict resource requirements.

In addition, the scheme of twenty (20) home health care components which is critical to the classification method has potential for the industry. The scheme can be used to link nursing diagnoses and nursing interventions to each other. It can be used for more efficient documentation of the home health care, for other research studies, and in the design of home health computer systems.

This classification method with these new tools could be used as a basis for a prospective payment system for home health care Medicare patients. It encompasses the scheme of twenty (20) home health care components which could also be used for reimbursement like the DRGs in hospital settings.

Limitations of this Study

This study collected data on patients for entire episodes of home health care. As a result many of the assumptions were not accurate and many of the data elements collected were not valid because of the varying nature of the home health agencies.

The major limitation was the use of secondary data from which predictions were made on resource requirements and outcomes of care. This was further complicated because: (a) trained abstractors were not used to collect the data, (b) questioning the primary nurse providers for items not documented in the patient's record was considered subjective, (c) home health agency records, from which the data were collected, were not uniform, and (d) summary data for a patient's episode of home health care were not precise enough to analyze individual visits.

Additionally, the narrative text was recorded for two critical variables (a) nursing diagnoses and (b) nursing interventions. This provided a new dimension to home health care research and required specific design processing strategies and statistical techniques to accommodate such a large size database.

Other limitations, with recommendations for future study, are described below.

Problems with Retrospective Data

The use of retrospective data prevented detailed study of individual nursing diagnoses assessed and nursing interventions provided for each home visit. A prospective study collecting data on individual visits could supply such data.

Problems with Summary Data

The data on the Abstract Form provided a cross-sectional summary of all events in the entire case and did not include changes in the patient's condition at different times during the episode of care. It also did not provide an accurate assessment of the patient's status on admission to home health care.

Disparity Between the National Sample Agencies and Sample Cases

The large number of agencies with a small number of cases prevented detailed study of the impact of agency characteristics on the patients served. An in depth study of a larger number of cases from a smaller number of home health agencies would permit addressing additional research issues pertaining to agency characteristics.

Problems with Admission and Discharge Data

Different agencies followed different procedures to identify the dates of admission and discharge from home. For consistency, the dates of the first and last visit were used to measure the length of the episode of care.

Problems with Retrospective Coding of Narrative Nursing Diagnoses and Nursing Interventions

The two schemes used for nursing diagnoses and nursing interventions were probably the most important outcomes of this study, but were limited by the nature of the narrative text provided by the agencies. Some agencies did not record comparable detail for nursing diagnoses and nursing interventions. When the coding schemes which have been developed are applied prospectively at the time of the visit, there will be more complete recording, better mapping and greater agreement between nursing diagnoses and nursing interventions.

Large Number of Variables in Regression Models

When large numbers of variables are used in a single regression model (such as the 88 independent variables in the nursing intervention by type of intervention model), there is a danger that spurious statistical significance will be obtained especially at a $p \leq .05$ level. Large numbers of variables also require large samples especially when the frequency of some events is low. The analyses based on the twenty (20) nursing diagnosis and nursing intervention home health care (HHC) components, however were very usable.

Using Resource Use to Predict Resource Requirements

All of the prediction models and cohort analyses are based on measures of actual visits or resource use. It was assumed that these variables accurately reflected resource requirements for care. However, actual use may be influenced by other factors including reimbursement policies or constraints on personnel or other constraints on the ability of an agency to provide care.

Limitations of Hospital Episode Data

The items on the Abstract Form dealing with hospital episodes prior to or during an episode of home health care were misinterpreted by some agencies, answered inaccurately by others, and may have been inadequate to address very complex cases. These problems limited an accurate analysis of hospital episodes occurring during episodes of care for the entire study population. Medicare claims records would provide an adequate solution to this problem when matched with the sample cases. This would also permit verifying visit counts and providing actual cost data for the episode of home health care.

Need to Test the Models with a Prospective Study

The best approach to addressing the limitations of this study is to conduct a prospective study using a refined assessment instrument and classification method using the nursing diagnosis and intervention coding schemes based on the results of the present study. A prospective study is the only way to accurately and independently validate the prediction models tested in this study.

Recommendations

Notwithstanding the limitations of this study several recommendations clearly emerged from this research:

- Nursing diagnoses and nursing interventions should form the basis for a Home Health Care Classification Method for predicting resource requirements. The scheme of twenty (20) home health care components for the nursing diagnoses and nursing interventions should provide a new framework for assessing and classifying nursing care requirements of patients.

- The scheme of twenty (20) home health care components for nursing diagnoses and nursing interventions could enhance the existing HCFA forms 485, and 486 used to collect data on Medicare patients. It could provide the basis for a new reporting form for home health care reimbursement.

- The Home Health Care Classification Method should incorporate three patient cohorts based on the length of the episodes of care in days. Cohort placement and the levels of care for each cohort will serve as a refinement for predicting resource requirements.

Other Recommendations

Other recommendations also emerged that address the need for further research on the analysis on the current research data, and for additional research.

Current Research

Claims Data: The value of the present data could be enhanced by linkage to claims data on hospital and long term care episodes for the cases included in this study. Cost data on each case were not available and not included in the analysis. Such data could expand the existing information on the cost of an episode of home health care by agency size, type of ownership, and geographic location, for specific patient's conditions.

Visit Data: Further analysis is needed on the mix of skilled nursing and home health aide visits and on the home health aide visits alone in the first thirty (30) days and total episode of care. These visits are different for the three cohorts and appear to relate differently with nursing diagnoses and nursing interventions than nursing visits alone.

Nursing Care Data: Further study is needed on the nursing diagnoses and nursing interventions and their groupings of home health care components. Research is needed to determine the clusters of conditions and care requirements that relate and can be mapped to each other. This type analysis was not attempted in this study, but the findings showed definite relationships between these two variables.

Additional Research

Prospective Study: A prospective methodological research study is needed to refine, test and validate the proposed Home Health Classification Method that is used to predict resource requirements and measure outcomes of care of home health Medicare patients. It will require the testing of the Assessment Instrument and Classification Method on admission, at the end of the first thirty (30) days, at thirty (30) day and sixty (60) day intervals during the episode of care and on discharge.

Home Health Care Visit Record: In addition, a specially designed home health care visit record will be used to collect and study the purpose and care provided for each home visit. It will be completed at each home visit by all providers caring for the patient. The periodic assessments made longitudinally will be used to fully describe the three cohorts and explain the differences between short term, intermediate, and long term care cases.

Prospective Payment System: The research study is critical to the development of a prospective payment system for home health care. It could be based on the nursing care requirements of patients based on the nursing diagnosis and intervention home health care components and on the three cohort model. This innovative approach could improve the efficiency of home health care reimbursement and influence cost containment policy for the industry.

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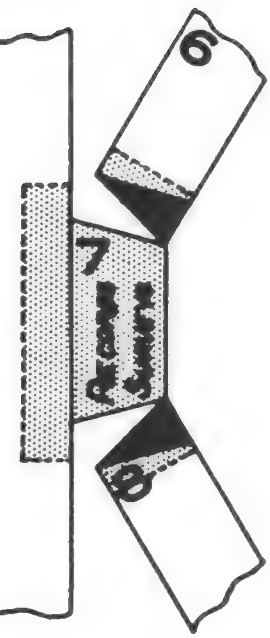

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CASE-MIX ANALYSIS USING GEORGETOWN DATA

HOME HEALTH PROSPECTIVE PAYMENT DEMONSTRATION

November 25, 1991

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GUIDE TO THIS REPORT

This report presents results of the analyses to develop a case-mix adjustor for per episode home health prospective payment using the data collected by the Georgetown University School of Nursing and makes recommendations for future analysis. It is presented in two parts. The first part presents results comparing different analytic techniques and our recommendations. The second part describes the data and the results obtained for individual analytic techniques.

The first part consists of four chapters and can stand alone as a summary. In Chapter I, we provide background for the remainder of the report by reviewing our original plans for the development of a case-mix adjustor and describing the dependent and explanatory variables used in our analysis. In Chapter II, we compare case-mix adjustors based on different analytic techniques with respect to the accuracy with which they predict home health cost. In Chapter III, we consider issues that will arise in the implementation of case-mix adjustors based on the analytic techniques which most accurately predict cost. In Chapter IV, we present our recommendations for additional analyses, including analyses of the data collected in the per visit prospective payment demonstration.

The second part of this document, consisting of Chapters V through X, provides more detail on everything discussed in Part 1. The opening chapter of Part 2 (Chapter V of the report) describes the database, and is followed by the description in Chapter VI of the construction and selection of the explanatory variables used in the analysis. Chapter VII presents the results for various regression models; Chapter VIII presents the results for CART (Classification and Regression Trees); Chapter IX presents the results for AUTOGRP (Automated Grouping System); and Chapter X presents the results for GoM (Grade of Membership).

PART 1

COMPARISON OF ANALYTIC TECHNIQUES, CONCLUSIONS AND RECOMMENDATIONS FOR FURTHER ANALYSIS

I. REVIEW OF PLANS FOR DEVELOPMENT OF CASE-MIX ADJUSTOR

Two important objectives of this project are to (1) develop a method for adjusting the fixed per episode payment rates in the forthcoming demonstration to account for changes in the mix of patients seen by agencies; and (2) to learn more about the factors that determine a patient's use of home health care. These objectives are obviously linked; a knowledge of the determinants of home health care use is necessary to develop an adequate case-mix adjustor. However, the objectives differ in that some variables that may be good predictors of resource use may be unsuitable for determining payment levels due to political factors or difficulties in obtaining the data in an ongoing program. Moreover, the schedule for the development of the case-mix adjustor is severely constrained, while that for the analysis of factors determining home health use is not. In order for the case-mix adjustor to be fully operational when the per episode demonstration is implemented, its development had to begin in 1991. This development work could not await the availability of sufficient data more comparable to that which will be available in a per episode demonstration.

Because of the severe time constraints on the development of the case-mix adjustor, we have developed a two-stage approach to analysis. The first stage uses existing data (the Georgetown data) to explore factors which determine home health use and to compare case-mix adjustors based on different analytic techniques. Although these data differ in several ways from the data that will be available during the per episode demonstration, they are available now, and can be used to test alternative methods for developing a case-mix adjustor. The second stage will rely largely on data collected in the initial months of the per visit demonstration and will be guided by the results obtained with the Georgetown data.

A. OVERVIEW OF GEORGETOWN DATA AND ANALYSIS PLAN

The Georgetown data includes information on the number of visits of each of the six types of visits covered by Medicare, the dates of these visits, characteristics of patients at admission and at

discharge, and treatments planned or received during the home health episode. All data was abstracted retrospectively from the records of agencies participating in the study by staff of the agencies involved. To obtain data on the use of other health services, we merged the Georgetown data with MADRS data.

The merged Georgetown-MADRS database contains over 6000 episodes of home health care. A random sample of approximately 1200 episodes was selected for use as a holdout sample for use in testing the predictive accuracy of alternative models. The other 4800 episodes (the "estimation sample") were used to develop the models.

Multiple analytic techniques were used to estimate the relationship between patient characteristics and episode costs (in the estimation sample), and then to predict costs for the holdout sample. We estimated models with a variety of multiple regression and classification procedures. The multiple regression procedures included ordinary least squares, log regression (to account for the skewness of the distribution of costs), Tobit (to enforce a minimum predicted value), and stepwise regression (to develop a more parsimonious model). We also used ordinary least squares to estimate separate models for patients receiving different skill mixes of services (skilled nursing only, skilled nursing and aide, etc.). The classification procedures included CART, AUTOGRP, and GoM. These procedures are described briefly in Chapter II, and more fully in Part II of this report.

B. DEFINITION OF EPISODE AND DEPENDENT VARIABLE

For the main body of analyses using the Georgetown data, we defined an episode of Medicare home health care as a series of Medicare home health visits preceded and followed by 30-day periods in which there are no Medicare home health bills. Episodes longer than 120 days were truncated at 120 days for the purpose of measuring cost because the per episode payment is expected to apply only to the first 120 days of care (with continuing care after 120 days paid for on a per-visit basis). We also explored a definition of an episode in which hospital stays (as well as periods without

Medicare home health care) mark the boundaries of episodes. However, as described in Chapter IV thorough analysis of this issue must await the availability of the demonstration data.

The dependent variable for the main body of analyses using the Georgetown data is a standardized measure of the cost of Medicare home health resources received through the end of the episode or in the first 120 days of the episode, whichever is shorter. We chose a standardized measure of cost, rather than charges, because charges would incorporate differences across agencies that are unrelated to home health resource use. The standardized measure of cost was constructed by determining the number of each of the six types of Medicare visits received by a patient during the period of interest, weighing the numbers of visits by a standard set of costs per visit, and summing to obtain a total cost. The standard set of costs was developed by taking the median cost for each type of visit from the most recent national data available, the cycle 10, Section 223 limit data, which is compiled from the Medicare cost reports submitted by individual agencies. The median cost per skilled nursing or speech therapy visit was $59; the median cost per physical therapy or occupational therapy visit was about $57; the median cost per home health aide visit was about $30; and the median cost per medical social worker visit was about $80.

C. EXPLANATORY VARIABLES

The number of explanatory variables that could potentially be developed with the Georgetown database is quite large. Not only are measures of a number of distinct concepts available, but there are a number of alternative ways in which one could construct explanatory variables about a single concept. For example, information on Activities of Daily Living at admission could be entered as counts of the number of tasks in which the patient was impaired or as a set of binary variables, and information on Activities of Daily Living at discharge could be entered separately or in terms of change since admission.

Our approach to developing a limited, yet comprehensive set of explanatory variables was as follows. We grouped concepts by substantive domain. Then, working with one domain at a time, we

developed alternative variables measuring individual concepts when that seemed appropriate and compared the ability of these alternatives to explain variation in standardized cost. We selected the variables with the most explanatory power or, if there was little or no difference in explanatory power, the variables that could most readily be obtained in an on-going program of prospective payment. (See Chapter VI for a detailed description of the process used to create and select the explanatory variables.)

The substantive domains into which concepts were grouped are:

- Medical condition
  - Care Group (based on diagnoses and procedures giving rise to a need for home health care)
  - Comorbidities
  - Severity of illness (proxied by use of health services)
- Functioning
  - Activities of daily living (at admission to home health care)
  - Sensory, cognitive, and other limitations
  - Equipment and supply use
- Nature of care
  - Treatments planned or received (using coding system on HCFA form 486)
  - Nursing interventions planned or received (using coding system developed at Georgetown University)
- Prognosis at admission
- Truncation of episode (e.g., nursing home admission or death during the home health episode)
- Response to Care
  - Change in functional status
  - Resolution of problems
- Informal caregiving
- Demographic characteristics.

We also distinguished between prospective or retrospective variables in the analysis. Prospective variables pertain to the patient's characteristics and circumstances at the time of, or prior to, admission to home health care. Retrospective variables pertain to the patient's characteristics and

circumstances during the home health episode or at discharge. We distinguished between prospective and retrospective variables, because the retrospective variables are less preferable on some theoretical and practical grounds. Retrospective variables (particularly those that measure the types of care rendered) tend to shift the payment system back toward cost-reimbursement, although none of the retrospective variables we considered measure the duration or intensity of care provided. Moreover, data collection costs are likely to be greater when both retrospective and prospective variables are included. Nonetheless, retrospective variables may prove much more predictive of the cost of home health services. This has been the case in predicting the cost of other health services.

II. COMPARISON OF CASE-MIX ADJUSTORS DEVELOPED USING VARIOUS TECHNIQUES

The accuracy of alternative models for predicting costs was assessed by comparing the actual and predicted cost for a set of observations that were not used in developing the models. This test set of observations, which we refer to below as the "holdout sample," was a randomly selected sample of the cases available for analysis. In Section A we describe the alternative models used to predict cost and the various measures of accuracy used. The relative accuracy of the predictions for the entire holdout sample is reported in Section B, and that for various subgroups of patients and agencies is reported in Section C.

The holdout sample was also used to simulate the effects of the different model predictions on agencies of different sizes. Under a prospective payment system, small agencies will have greater variability in net income compared with larger agencies since they have fewer patients to even out under-reimbursed patients with over-reimbursed patients. The variability of payment accuracy for agencies of different sizes was assessed by artificially creating many agency caseloads of different sizes, computing the ratio of predicted to actual costs for each, and examining the distribution of this ratio for our simulated agencies. The detailed results by agency size are reported in Section D of this chapter.

Despite the flexibility and statistical sophistication of several of the models we used, a straightforward multiple regression model yielded the best predictions. However, several of the models produced estimates that were nearly as accurate. The CART model was particularly appealing because it performed nearly as well as regression and used considerably fewer variables. As we explain in Section E, the lack of a decisive winner in these comparisons means that other considerations may dictate the ultimate choice of models.

A. MODELS AND MEASURES OF ACCURACY

To adjust agency payments for changes in their case-mix, we seek the best possible method for predicting the standardized cost of an episode, using the data that are available on each patient. We have tried several estimators that differ on statistical assumptions, analytic procedures, numbers of variables, criteria for selection, and ease of interpretation. The alternative models are evaluated by comparing them on various measures of goodness-of-fit, calculated on the holdout sample.

After eliminating observations with inconsistent or incomplete data, the Georgetown data set had 6,095 observations. We arbitrarily chose to allocate approximately 20 percent of this sample to the holdout sample. The holdout sample was randomly selected by choosing patients whose Social Security Number ended with a "4" or "7." This process yielded an estimation sample with 4,862 observations and a holdout sample with 1,233 observations.

1. Models Used to Predict Cost

Four distinctly different types of procedures were used to predict costs from the set of explanatory variables available: regression analysis, the classification analysis and regression trees (CART) model, the Automated Grouping System (AUTOGRP), and the grade-of-membership (GoM) approach. In addition, variants on some of these approaches were tried, such as different functional forms (using the log of costs in the regression model), procedures that require the predicted cost to be positive (Tobit analysis), and alternative functional forms (allowing interaction terms). In all, 7 different models were examined. More detailed descriptions of these procedures are given in Part 2 of this report.

The four most successful models were the following:

Regression. An ordinary multiple regression model was used first, with cost as the dependent variable. However, because of the large number of variables that were considered to be potentially important, the model was somewhat unwieldy and contained many statistically insignificant coefficient estimates. We then refined the model by using the stepwise regression procedure, which resulted in

a much more parsimonious model (65 variables) and a slightly improved fit. This parsimonious model was the regression specification used in our comparisons of different models. For all regression models except the log regression, the procedure for generating predicted values is the same. The estimated coefficients are multiplied by the values of the explanatory variables in the holdout sample and summed to obtain predicted costs. In some cases, the predicted value was negative, which implies that the home health agency would have to pay to accept the patient. Since predicted costs below zero are inaccurate and unacceptable, we set all regression predicted estimates that were below $59 equal to 59 dollars, the standardized cost of one nursing visit.[1]

Log Regression. We also estimated a regression model with the logarithm of cost as the dependent variable. This approach was tried because costs had a skewed distribution that resembled the log normal distribution much more closely than the normal distribution. Using the logarithm of cost as the dependent variable has the added advantage of constraining predicted values for costs to be positive.

The predicted values were generated by first multiplying the estimated parameters by the value of the explanatory variables and summing as in the regression case, then taking the antilog of the generated values. We then multiplied the initial estimate by another factor, the "smearing factor," to eliminate the bias in this initial estimate. Use of the smearing factor, which is equal to the average ratio of actual cost to the initial estimate in the estimation sample, provides a more accurate and robust estimate of actual cost than the scale factor usually used to eliminate bias ($\exp(s^2/2)$) in problems such as this (Duan et al., 1982).

CART. CART is a classification program that creates a set of rules to split a sample into groups, based on the values of the explanatory variables. It creates groups by trading off two goals--making within-group variation in cost as low as possible and keeping the number of groups as small as possible. In the holdout sample, we assigned cases into groups using the classification criteria

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[1]About 2 percent of the estimation and holdout samples had only one nursing visit.

developed on the estimation sample. The predicted cost for patients in the holdout sample who are assigned to a particular group is the mean cost of everyone in that group in the estimation sample.

GoM. GoM is a procedure somewhat similar in concept to factor analysis. GoM identifies a number of unobservable "pure types" of individuals and estimates the relationship between each of the variables in the analysis, including cost, and the pure types. The procedure also estimates the degree to which each patient resembles each of the pure types, that is, the probability that each patient is each of the pure types. Once the GoM model was estimated, cost was regressed on the set of predicted pure type probabilities for the estimation sample. To obtain predictions for the holdout sample, the probability of being each of the pure types was calculated using parameters estimated from the estimation sample together with all of the exogenous variables from the holdout sample (i.e., all of the variables except cost). The calculated probabilities were then multiplied by the coefficients from the earlier cost regression and summed to obtain predicted cost.

The four models above were the most promising and results for them will be presented for both the full holdout sample and for subgroups of the holdout cases defined by patient and agency characteristics. To make comparisons simpler, the results for the methods that performed somewhat less well will be presented only for the full sample.

The three methods that yielded slightly less accurate estimates or that were considered to be inferior to one or more of the above models for other reasons included the following:

AUTOGRP. This procedure is similar to CART in design, in that it assigns patients to groups based on the characteristics of the case. However, AUTOGRP leaves decisions about what groups to split or combine to the analyst, rather than relying on predetermined statistical criteria. The predicted values from the AUTOGRP model for the holdout sample are generated in the same manner as CART.

Tobit. Although the regression model predicted well, one problem was that it yielded predicted values that were negative or extremely small for one to two percent of the estimation sample. To

eliminate this problem and ensure that no predicted value below some minimum could be obtained, we estimated a Tobit model, with all actual values of $59 or less set equal to the "lower bound" of $59. The predicted cost obtained from this model is guaranteed to equal or exceed $59 for all sample members.

Interacted Regression. The GoM, CART, and AUTOGRP procedures allow interactions of characteristics in predicting costs, whereas regression allows only linear combinations. To determine whether the regression model estimates would be significantly improved by allowing interactions, we divided our sample into four subgroups defined by the skill mix of services received (e.g., nursing only, nursing and aide), estimated separate regressions for each and identified variables for which substantial differences were observed. We then included all of the original variables plus all of the additional interaction terms that might be important in a stepwise regression model, to pare down the model to variables and interactions that contribute substantially to the prediction of costs.

Before turning to the description of the goodness-of-fit criteria used to assess the models, we must note one other important variation that was tried at an early stage and rejected. The variation was to limit the set of explanatory variables used in predicting cost to only patient characteristics observable at intake. This restriction meant that variables from the Medicare plan of treatment (486) forms concerning the types of home health care that the agency felt was needed (such as wound care and administration of intravenous therapy), were excluded from the models.

Our models with the treatment variables excluded predicted very poorly, even in the estimation sample (they explained less than half as much of the sample variance in costs as the full model did). Furthermore, when these treatment variables were included, they were found to be the most significant predictors by a wide margin in each of the estimation procedures. These findings led us to reject the approach of excluding nurses' judgments about patient needs from the allowable set of variables. Although one could argue that such variables are endogenous, we believe that their inclusion is justifiable, being somewhat analogous to the DRG method of basing reimbursement on

the health care services received by the patient (e.g., foot surgery for diabetic patient, removal of certain sections of the colon, etc.). In fact, DRG's are based on the care actually **received** by the patient, whereas the treatment variables on the 486 form are what is **prescribed** for the patient. (The Georgetown data on treatment variables, however, reflects both information from the 486 forms and care that was actually received. See Chapter V for details.) Furthermore, the treatment variables only indicate the discipline (nursing, type of therapy, aide) and treatment; they do not specify the length or intensity of treatment.

This rationale and the certain knowledge that the case-mix adjustor would be wildly inaccurate if such variables were excluded from the models led us to the decision to retain them. The goodness-of-fit measures for the regression model with the treatment variables excluded are compared in Chapter VII to the full regression model to illustrate the importance of these variables.

2. Measures of Model Accuracy

One method of comparing models is to look at the differences between actual and predicted cost in the **estimation** sample. However, the model with the smallest differences between actual and predicted cost in the estimation sample will not necessarily give the most accurate predictions when used on another sample. One common problem is "overfitting." Overfitting occurs when the estimates are distorted by sample outliers, which will be associated just by chance with certain combinations of the explanatory variables. If a model includes many explanatory variables and allows many interactions between the explanatory variables, it may "predict" the outliers in that sample reasonably well[2]. But when another sample is drawn, there will be another set of outliers that are (by chance) associated with a different combination of the explanatory variables. The model, however, will continue to predict outlying values for the original combination of explanatory variables

[2]Outliers are, by definition, large unexplainable deviations from the population relationship between the explanatory variables and the dependent variable. If many explanatory variables are used the predicted values for outliers in a sample may be quite close to the actual values, but the model may yield poorer estimates in another sample than would a simpler model.

and perform poorly with the second sample. Using a holdout sample gives a better indication of how well the model will predict for the total population of Medicare users of home health services.

In deciding which estimator is preferred we examined a number of criteria, in order to test the robustness of our selection. The following six measures of accuracy were calculated on the holdout sample, where $\hat{C}_i$ and C_i are the predicted and actual cost for patient i and N is the number of cases examined:

- $R = \sum \hat{C}_i / \sum C_i$. The ratio, R, indicates the degree to which predicted costs are correct on average. A value of R below 1 means that the home health agency will not recover its cost if paid the predicted amount, while an R above 1 means that the agency will be over-reimbursed.

- $RMSE = \sqrt{\sum (C_i - \hat{C}_i)^2 / N}$. The root mean squared error, RMSE, measures the degree of dispersion around the actual value. Since it squares the difference between predicted and actual costs, it puts much more weight on large differences than on small differences.

- $MAD = \sum | C_i - \hat{C}_i | / N$. The mean square deviation, MAD, also measures the degree of dispersion around the actual value. It has the intuitive appeal of being the average absolute prediction error, i.e., the average difference between predicted and actual costs. The MAD is less heavily influenced by outliers than the RMSE, a desirable trait for some purposes but not for others. The RMSE measure is preferable when we are especially concerned about extreme prediction errors for individual cases. MAD is preferable when we are concerned about average prediction error for the sample as a whole.

- $MPAD = (\sum |C_i - \hat{C}_i| / C_i) / N$. The mean percentage absolute deviation, MPAD, measures absolute error in percentage terms. This measure penalizes estimators more for deviations in low cost cases than for deviations of the same magnitude in high cost cases (e.g., a \$200 error on a case with an actual cost of \$200 is treated as being 10 times more serious than a \$200 error for a case with a cost of \$2,000).

- 20E = 20th percentile of $(\hat{C}_i - C_i)$. The 20th percentile of the error, 20E, gives an indication of the range of the deviations from predicted cost. Twenty percent of the patients will have greater negative deviations than this value. Note that for this statistic, the error is defined as predicted cost minus actual cost, rather than the conventional definition of actual minus predicted costs. Thus, negative values imply that reimbursements based on predicted costs would be less than actual costs.

- 80E = 80th percentile of $(\hat{C}_i - C_i)$. The 80th percentile of the error, 80E, gives an indication of the range of deviations for the positive side of the distribution. For twenty percent of the patients, agencies would receive reimbursement that exceeded actual cost by more than 80E.

A good predictor should do equally well in all subgroups. A predictor with this characteristic is robust, will not adversely affect particular types of agencies, and will not create incentives for home health agencies to discriminate against any patient subgroups. To check the models' performance in subgroups, we split the sample by various criteria such as geographical region and skill mix of services received. The six measures of accuracy were calculated for each subgroup and compared with the same measure for the overall sample.

B. RESULTS FOR THE FULL HOLDOUT SAMPLE

There is little difference between the distribution of actual standardized cost in the estimation and the holdout samples. The mean cost is $939.41 (about 16 nursing visits) in the estimation sample and $940.10 in the holdout sample. As Figure II.1 illustrates, both distributions have a log-normal shape. There are many low-cost episodes, with about 15 percent below $250 (about 4 nursing visits) and nearly 40 percent below $500. The most common cost range is between $250 and $500, with about one-fourth of all episodes falling in this range. The number of episodes decreases steadily as cost increases above the $500 level. About 8 percent of episodes have costs between $2,000 and $3,000; only 4 percent have costs over $3,000.

1. Distribution of Actual and Predicted Costs

Figures II.2 to II.6 show the distributions of actual and predicted cost for the four main models and a restricted regression model in which the treatment variables have been excluded. The figures should be interpreted cautiously, because the actual values and predicted values within a given range on the distributions are not necessarily for the same observations. Even if the distribution of actual and predicted costs matched exactly, the model might fit poorly because predicted cost in one range of the distribution could correspond to actual cost in a completely different range. However, while similar distributions for actual and predicted cost is not sufficient evidence that a model fits well, poor correspondence between the two distributions is evidence that it does not fit well.

FIGURE II.1
ACTUAL COST IN ANALYSIS AND HOLDOUT SAMPLE

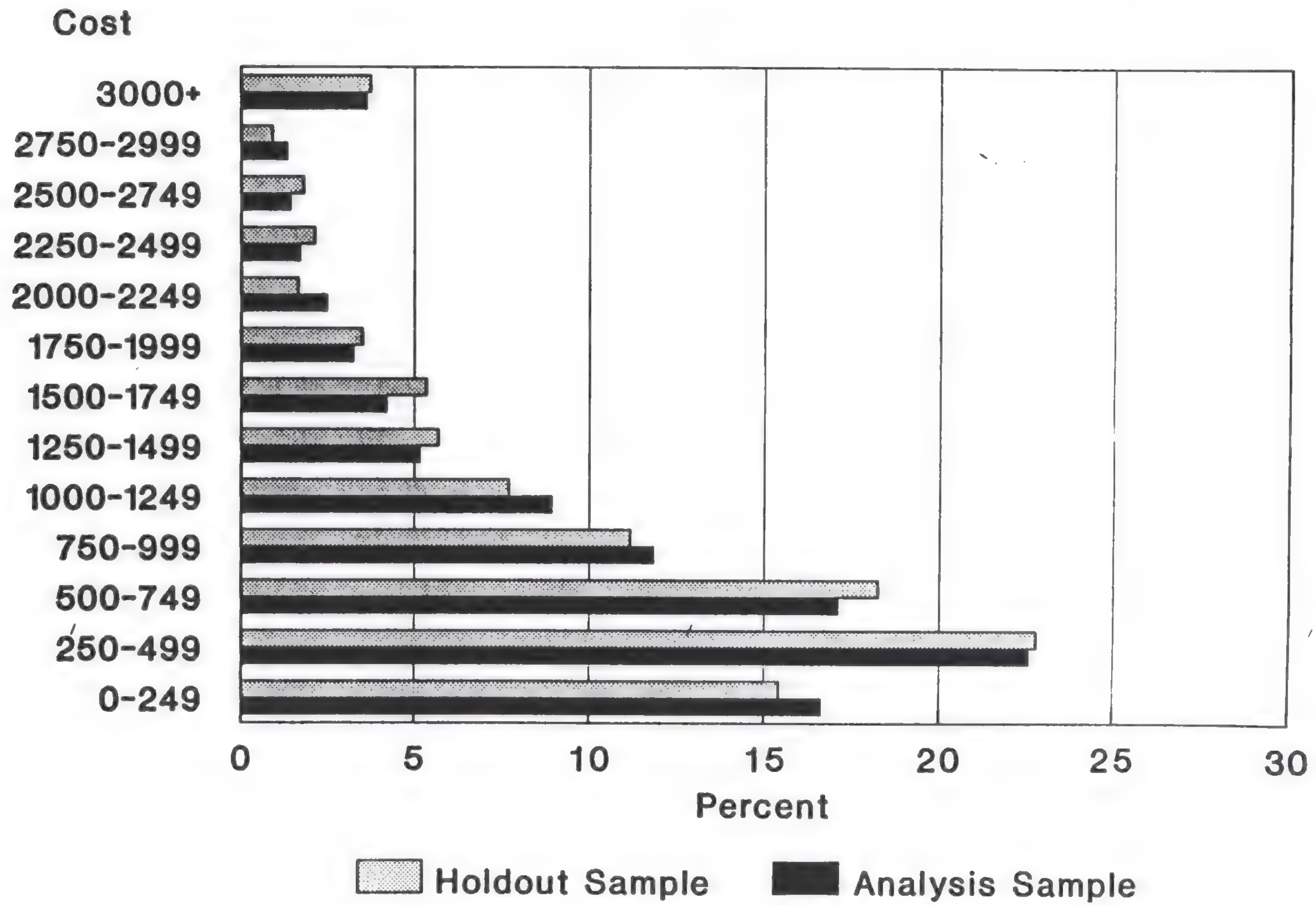
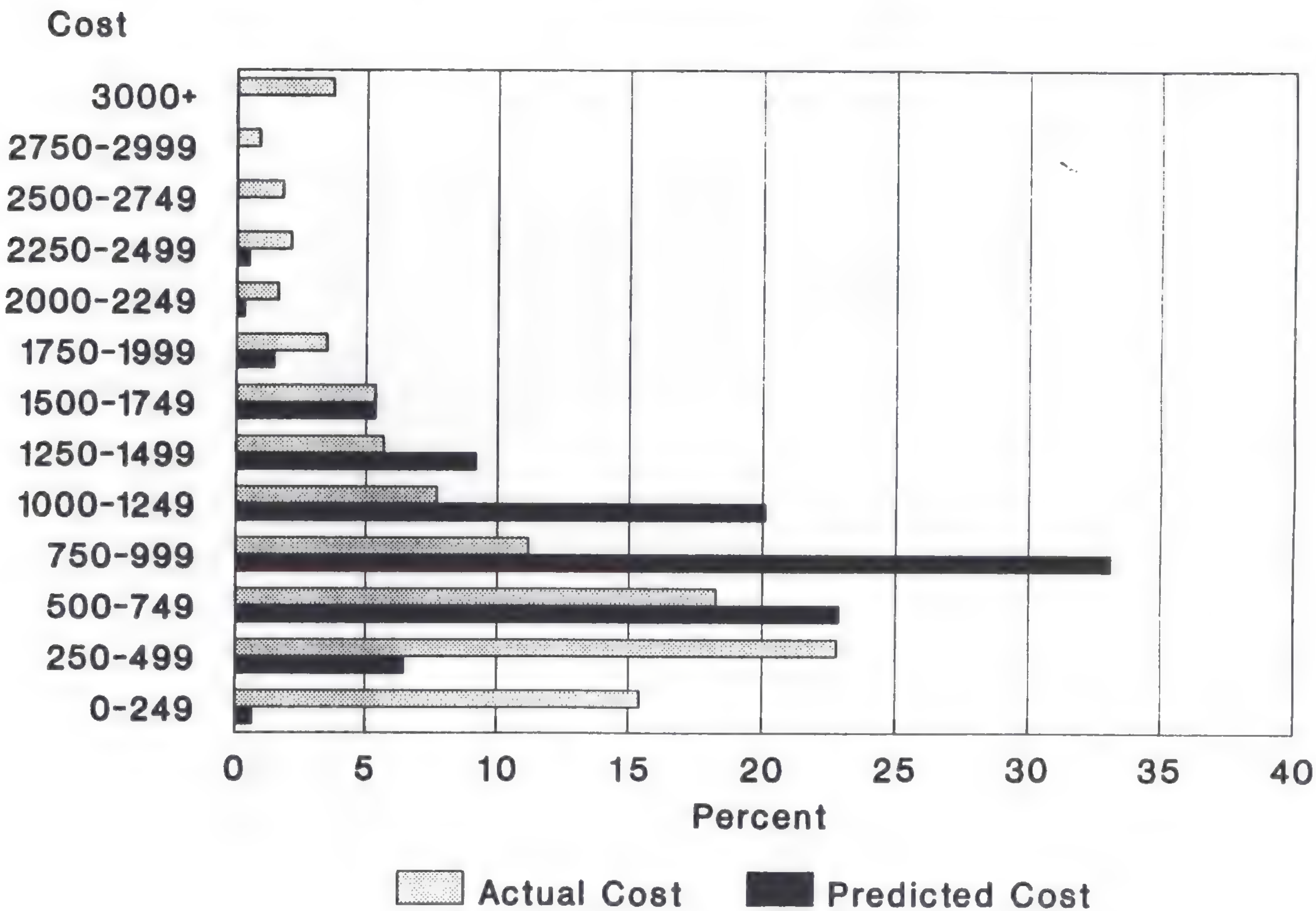


FIGURE II.2
PREDICTED COST FOR RESTRICTED REGRESSION



20

FIGURE II.3
PREDICTED COST FOR REGRESSION

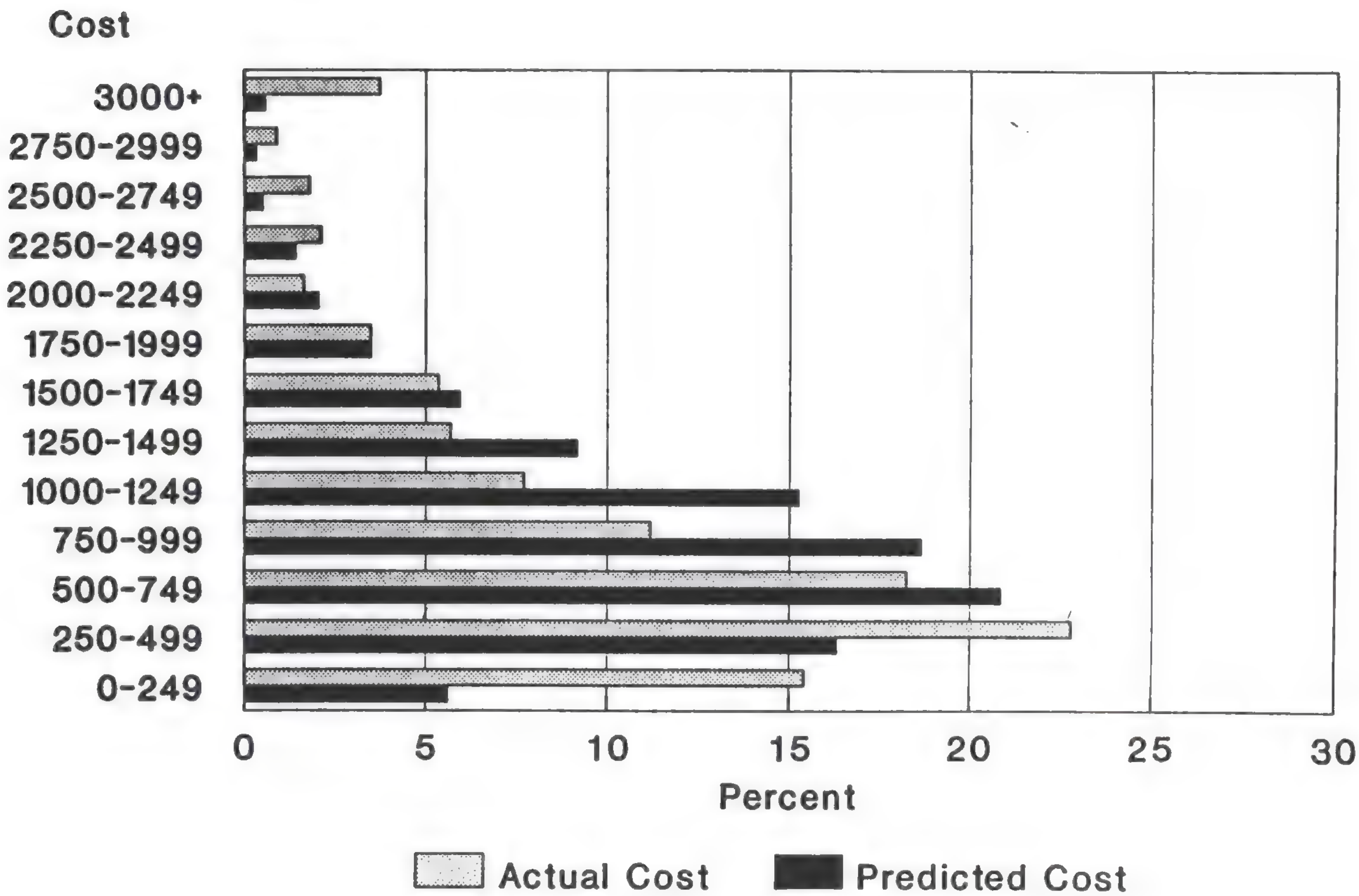


Figure II.4
PREDICTED COST FOR LOG REGRESSION

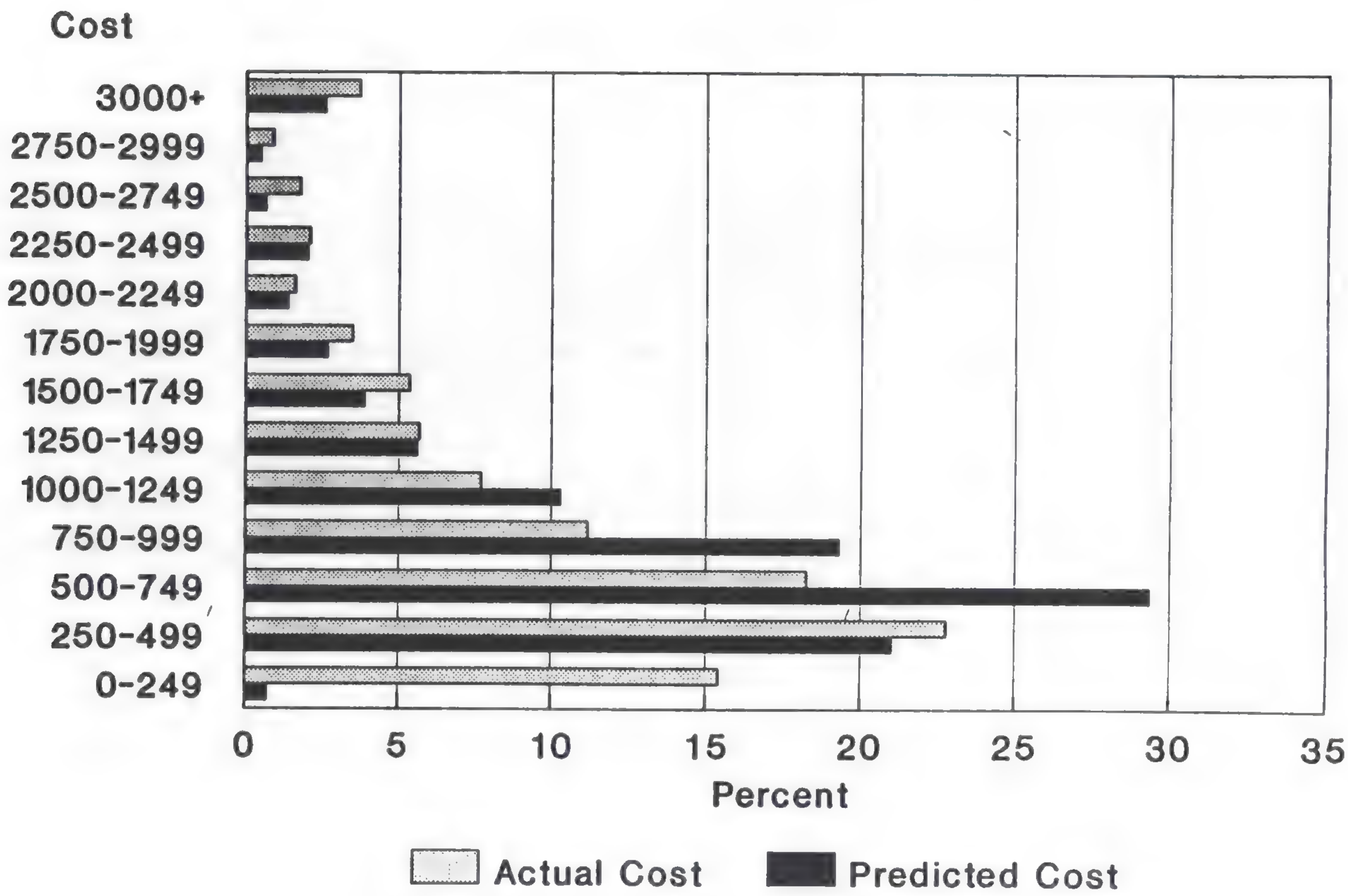


Figure II.5
PREDICTED COST FOR CART

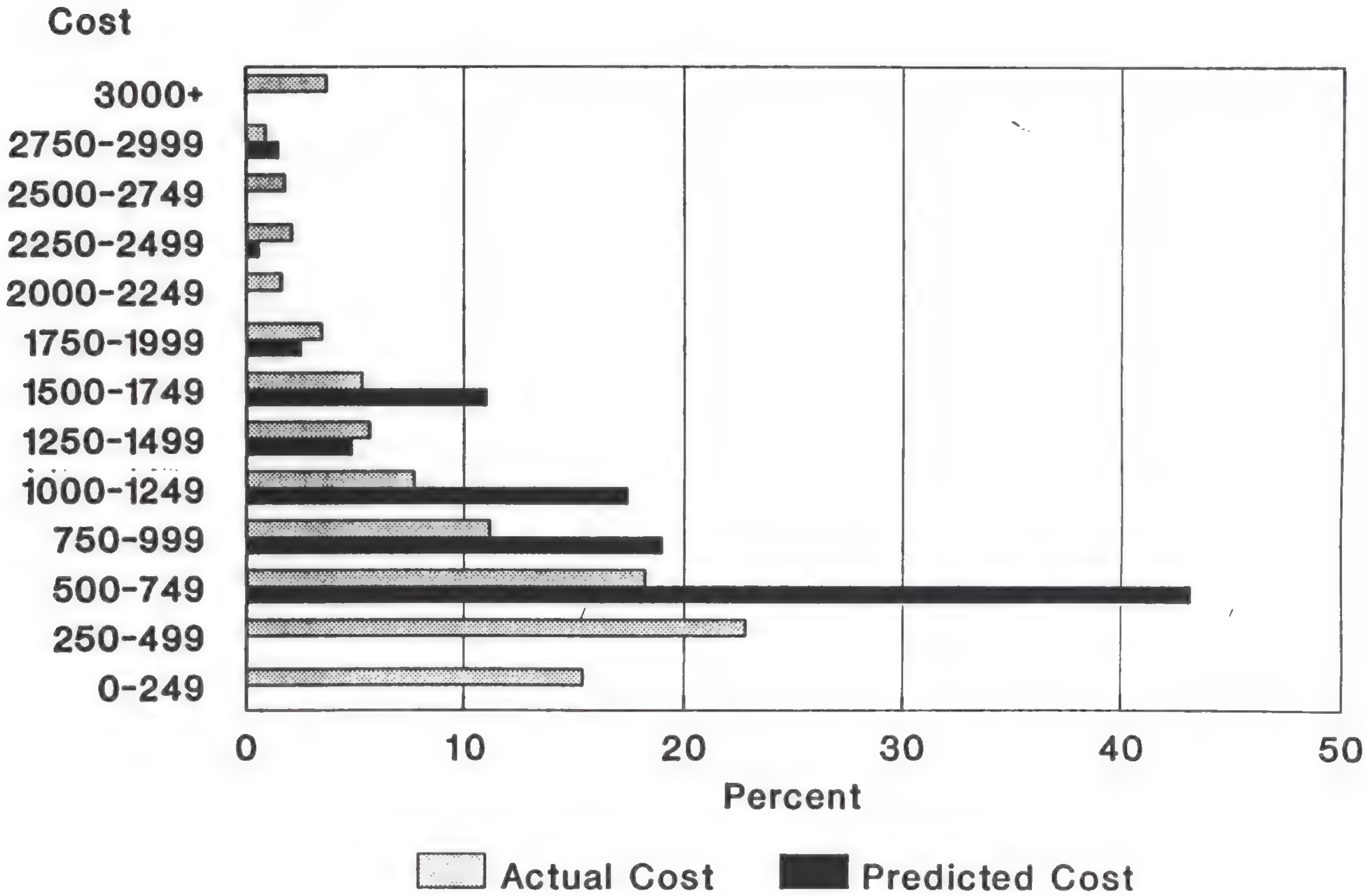


Figure II.6
PREDICTED COST FOR GOM

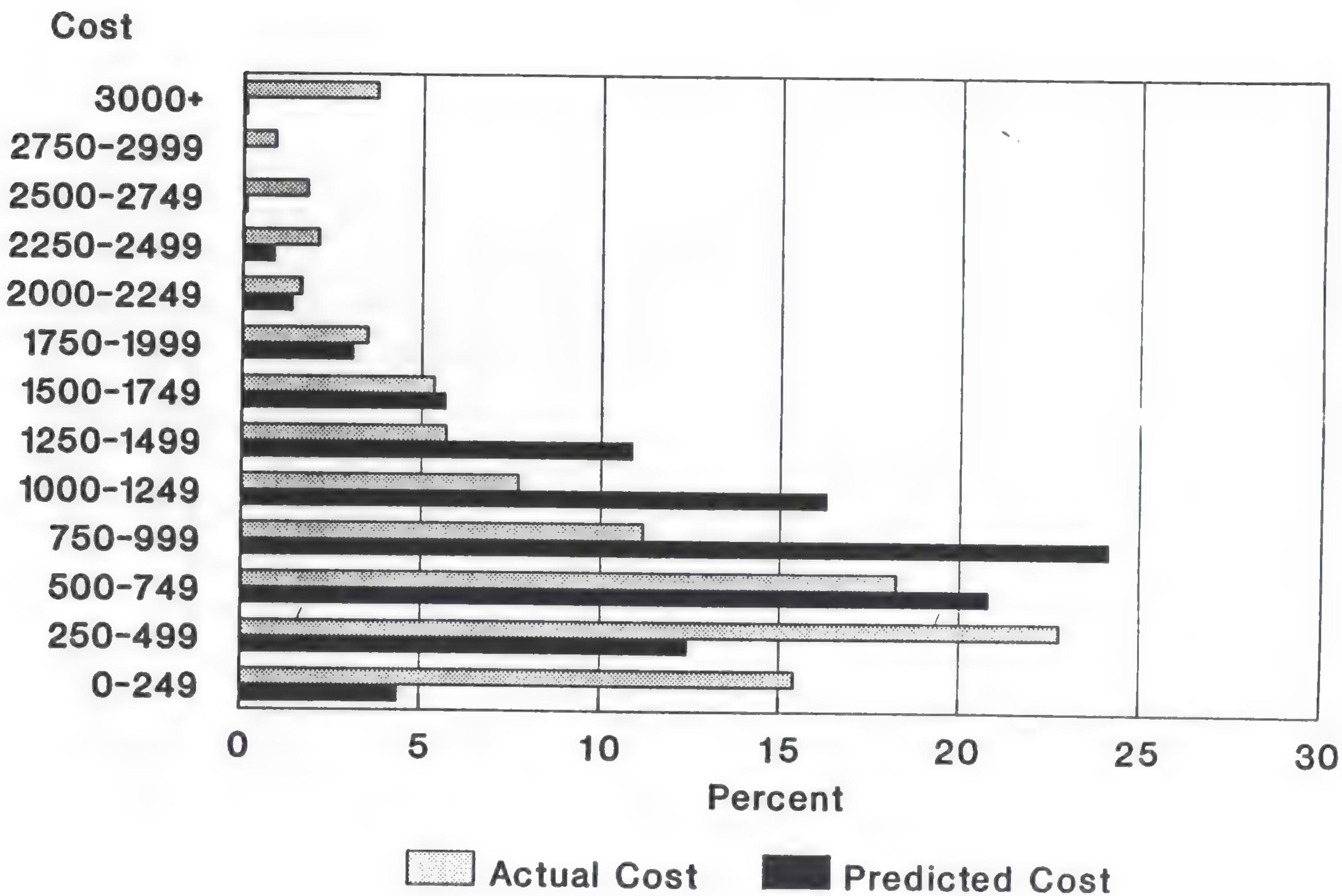


Figure II.2 plots the predicted values from the restricted regression, which eliminates all of the treatment and response-to-care variables. The distribution of predicted values is quite different from that of actual values. Predicted values are centered around the mean of the entire sample and there is a roughly symmetric and tight distribution around the mean value. This model seems to basically predict the mean and explain little of the variation in actual cost.

The distribution of predicted values for the parsimonious regression model (Figure II.3), which includes the treatment variables and eliminates insignificant variables, is much closer to the distribution of actual costs. The predicted distribution is skewed, with a large number of predicted values in the low cost ranges and few in the high cost range. However, the model still predicts far too few cases in the lowest and highest cost categories, and too many in the $500 to $1,500 range.

The distribution of predicted values for the log regression model (Figure II.4) contains almost no predicted values less than $250, where 15 percent of actual values lie. The log regression predicts more cases to have costs above $3,000 than do the other models, although still less than actually exist. There are also many predicted values above $2,000, but again still less than the actual number.

The distribution of predicted values for CART (Figure II.5) is much more concentrated in the middle range than the other models. Its unusual barbed appearance is due to the fact that every patient assigned to a CART group is given the same predicted value. The large number of people in the $500 to $750 range, 43 percent of the sample, is caused by the large number of people assigned to a single cost group. There are no predicted costs under $500 or over $3,000 and few above $2,000.

The distribution of predicted values for the GoM model (Figure II.6) matches the actual distribution more closely than any of the other models except the regression model. The $750 to $1,000 range has the most observations. There are many observations below $500, but still much less than in the distribution of actual costs. There are almost no cases predicted to cost over $2,500.

2. Measures of Accuracy

The models all yield substantially better estimates of costs than does the overall mean of the estimation sample. However, as Table II.1 shows, the improvement is not overwhelming. For example, the mean absolute deviation (MAD), which measures the average prediction error, ranges from $477 to $537 for the 7 models estimated on the full set of variables, compared with $632 if the estimation sample mean is used as the prediction of cost for all cases. Even in the best model, the average absolute error is over half the size of the average cost for the sample.

Of the four models considered most promising (parsimonious regression, log regression, CART, and GoM), the parsimonious regression model provided the most accurate estimates, but the other models were not markedly worse. The log regression was unusual because it had a low MAD but a high RMSE. The regression model with interactions had the best fit of all. However, because it performed only slightly better than the parsimonious regression, but used many more variables and is much harder to interpret, we did not consider it a promising model for use in developing a case-mix adjustor.

a. Overall Accuracy of the Estimators

In evaluating the estimators, we required R, the ratio of average predicted cost to average actual cost, to be close to 1.0. While small differences between R and 1.0 are not important, large or moderate differences indicate that the model will systematically over- or under-predict if the case-mix is similar to the holdout sample. However, this criterion was treated as a necessary but not sufficient condition for the estimator to be acceptable, since large errors on many individual cases, even if they balance out in a large random sample, could lead to substantial overall errors for a particular agency, particularly a small agency. Furthermore, large errors on individual cases could lead agencies to avoid patients for whom the models undercompensate. Finally, if the value for R in the estimation sample

TABLE II.1

MEASURES OF ACCURACY OF ALTERNATIVE PREDICTORS,
EVALUATED FOR THE ENTIRE HOLDOUT SAMPLE

	Sample Mean	Parsimonious Regression	Log Regression	GoM	CART	Restricted Regression	Tobit	Interacted Regression	AUTOGRP
$R=\Sigma\hat{C}i/\Sigma Ci$	0.999	0.994	1.023	0.989	0.994	1.005	1.059	0.989	0.996
$RMSE=\sqrt{\Sigma(Ci-\hat{C}i)^2/N}$	880	733	818	750	772	820	733	724	797
$MAD=\Sigma\lvert Ci-\hat{C}i\rvert/N$	632	481	495	509	518	570	495	477	537
$MPAD=(\Sigma\lvert Ci-\hat{C}i\rvert/Ci)/N$	1.41	0.89	0.84	1.00	1.00	1.24	1.01	0.85	1.08
20th percentile of $\hat{C}i-Ci$	-535	-339	-350	-403	-406	-447	-283	-376	-364
80th percentile of $\hat{C}i-Ci$	644	469	417	486	464	567	510	450	489

NOTE: The models were all estimated on the estimation sample of 4,862 cases. Measures of accuracy were computed for the holdout sample of 1,233 cases. AUTOGRP and GoM had missing predicted values because some explanatory variables were missing. As a result, AUTOGRP statistics are based on 1,220 observations and GoM statistics are based on 1,168 observations. All other models are based on the entire 1,233 observations. The minimum predicted value for regression, interacted regression, and GoM was set at \$59, the cost of one skilled nursing visit. The other models always had predicted values greater than \$59. The sample mean for the dependent variable (cost) was \$940 for the estimation sample and \$939 for the holdout sample.

is required to be essentially 1.0 (as is the case for regression, CART, GoM, and AUTOGRP) the value for R in the holdout sample is likely to be close to 1.0 as well, because the holdout sample is large and randomly selected.[3]

All of the models except Tobit and log regression yield a value for R that is within the .99 to 1.01 range. The R values for Tobit and log regression imply that these two models will overpredict costs by 5.9 and 2.3 percent, respectively. The overestimation by the Tobit model is too large to ignore, so we view this model as inferior to the others.

2. Measures of the Average Absolute Error for Individual Patients (RMSE, MAD, MPAD)

The more common criterion for comparing estimates, the square root of the mean squared error (RMSE), is smaller for the parsimonious regression, interacted regression, and Tobit models. The log regression model and AUTOGRP perform poorly on the RMSE criterion, with values 9 to 12 percent greater than that of the regression model. The interacted regression model has the smallest RMSE, but it is only about 1 percent below the value for the parsimonious model, despite including about 50 percent more variables. Compared to regression, the RMSE is about 2 percent larger for GoM and about 5 percent larger for CART.

The mean absolute deviation measure is also smaller for the parsimonious and interacted regression than for other models. Again, the interacted model does better than the parsimonious model by the slightest of margins. GoM, CART, and AUTOGRP all do noticeably worse than the other models on this measure.

Finally, on the mean percentage absolute deviation, the log regression model does best, followed closely by the interacted and parsimonious regression models. Although the average absolute error for these models is quite large (84 to 89 percent of the mean), it is even larger in the other models.

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[3]The requirement that the average predicted value equals the average actual value for the sample on which the model was estimated is implicit in regression (the average residual must be zero). Since AUTOGRP and CART use cell means as the predicted values, this condition also holds for these models. Finally, since the cost weights for the GoM types were obtained from a regression, the equivalence should hold for GoM as well.

In the other models, the average absolute deviation is at least as large as the mean (MPAD equals 1.00 or larger).

The 20th percentiles of the error distributions suggest that underprediction is least severe for the Tobit model (20 percent underpredicted by at least $283). This finding is consistent with the general overprediction by the Tobit model, as :vealed by the R measure. Parsimonious regression, log regression, AUTOGRP, and interacted regression underpredict by somewhat larger amounts than Tobit, while GoM and CART have the largest underpredictions.

Comparison of the models on the degree of overprediction, however, yields a quite different ranking of the models. Tobit overpredicts by more (has a higher 80th percentile) than any other model, whereas the log regression model overpredicts the least. The other models all fall somewhere between these two extremes. Again, the Tobit model's performance is affected by its overprediction on average. However, the log regression model also overpredicts on average but has the lowest 80th percentile of errors. This pattern in the log regression model occurs because overprediction tends to occur most often for the cases with low actual costs, and the log regression model implicitly gives more weight to such errors in choosing parameter estimates. That is, when the dependent variable is the log of cost, a $200 error on low cost cases creates a bigger residual than a $200 error on high cost cases. Log regression is essentially minimizing the sum of squared **percentage** errors in the unlogged variable. Thus, the log model will tend to make smaller absolute errors on low cost cases, leading to less overprediction.

3. Selection of Models for Further Analysis

Based on the results in Table II.1, we delete the AUTOGRP, Tobit, and interactive regression models from further consideration. The AUTOGRP model has been dropped because it is similar to CART in being a grouping procedure, but does not perform as well. The Tobit model has been dropped despite doing well on most measures because it overpredicts by too much on average. The interactive regression model has been dropped because it performs only slightly better than the

parsimonious regression model on any measure, but involves many more variables and is difficult to interpret. Thus, for subgroups we compare the relative accuracy of only four models--parsimonious regression, log regression, CART, and GoM.

C. RESULTS FOR SUBGROUPS

Although the regression model appears to yield the best estimates overall, it may be the case that it does not perform well for various subgroups of patients. Examining subgroups in particularly important, since systematic over- or underprediction for certain types of agencies or patients could cause serious inequities. Examining subgroups also provides a test of the robustness of alternative models by measuring performance on non-random subsets of the population.

To facilitate comparison of the models' performance across subgroups, we present the various measures of predictive accuracy for subgroups as the **ratio** of the test statistic for the subgroup to the test statistic for the entire holdout sample. The best possible result is a ratio of 1 over all subgroups, which indicates that the model fits equally well (or poorly) for each of the subgroups examined. In comparing across models, however, a value closer to 1 for Model A than for Model B for any particular subgroup does **not** imply that Model A fits the data better for that subgroup. It only implies that the fit for the subgroup is closer to the overall fit when Model A is used than when Model B is used.

We divided the sample by various characteristics of patients and agencies. For patients, we used the following characteristics: race, age, actual cost of home health services, skill mix of services received, number of impairments on activities of daily living (ADLs) at admission and discharge, whether discharged from a hospital, and use of home health services in the prior six months. For agencies, we used the following characteristics: geographic region, urban/rural setting, size, and auspices/control of agency (e.g., proprietary, hospital-based).

In general, the subgroup results do not strongly favor any model, though the regression and log regression models tend to perform better than CART or GoM. Both regression models do

particularly well for the R measures. Rarely does a single model do best (have values closest to one) for all subgroups defined by a single patient or agency characteristic. Of the subgroups that we considered, there was no case where a single model was best for all measures of accuracy.

Given the somewhat inconclusive nature of the results and the volume of statistics, we present here our findings for only a few of the most important subgroups. Table II.2 presents the results for four subgroups defined by skill mix of services received--nursing only; nursing and aide; nursing and therapy; and nursing, therapy, and aide. We then compare across subgroups defined by actual cost of home health services--high (over $1,500), medium ($500 to $1,500), and low (under $500). To simplify the comparison of the performance of alternative models we present the ratios of subgroup to overall performance on each of the accuracy measures, plus the average and average absolute deviation of the ratios from 1.0 for each model. That is, we subtracted 1.0 from each of the ratios, summed these deviations (and the absolute deviations), and divided by the number of subgroups. The model with the smallest average deviation from 1.0 on a particular test statistic best satisfies the criterion of fitting all subgroups equally well.

1. Skill Mix Subgroups

For subgroups defined by skill mix, the log regression and parsimonious regression models perform the best across the set of measures. For the R measure, the log regression performs best; its ratios differ from 1.0 by less than .01 on average across the four subgroups, and the average absolute deviation from 1.0 is only .04. GoM performs the worst of the four models, with an average absolute deviation of .19. Since the overall fit (R) for each of the models is quite close to 1.0, the denominator in the subgroup ratios is about 1.0; hence, the subgroup ratios on the measure are approximately the ratio of predicted to actual average cost within each subgroup. Thus, the average absolute deviation of .19 for GoM implies that within a given subgroup of episodes defined by skill

TABLE II.2

MEASURES OF RELATIVE ACCURACY FOR SUBGROUPS
DEFINED BY SKILL MIX OF SERVICES RECEIVED

	Nursing Only	Aide and Nursing	Therapist and Nursing	Therapist, Aide, and Nursing	Average Absolute Difference[a]	Average Difference[b]
Number of Observations	546	262	195	207		
R						
Regression	1.07	0.98	1.15	0.87	.08	.00
Log Regression	1.02	0.92	1.06	1.01	.04	.00
GoM	1.24	0.94	1.19	0.72	.19	.02
CART	1.15	0.98	1.02	0.85	.09	.02
RMSE						
Regression	0.81	1.09	0.92	1.37	.18	.05
Log Regression	0.79	1.00	0.86	1.52	.22	.04
GoM	0.85	0.96	0.85	1.44	.20	.03
CART	0.77	1.04	0.96	1.45	.19	.06
MAD						
Regression	0.76	1.13	1.02	1.47	.22	.10
Log Regression	0.73	1.09	0.94	1.70	.28	.12
GoM	0.85	0.96	0.96	1.47	.18	.06
CART	0.74	1.08	1.01	1.58	.23	.10
MPAD						
Regression	1.21	0.90	0.94	0.61	.19	-.09
Log Regression	1.20	0.84	0.89	0.77	.18	-.08
GoM	1.40	0.73	0.83	0.41	.36	-.16
CART	1.23	0.88	0.87	0.62	.22	-.10

TABLE II.2 (continued)

	Nursing Only	Aide and Nursing	Therapist and Nursing	Therapist, Aide, and Nursing	Average Absolute Difference[a]	Average Difference[b]
20th Percentile of Error						
Regression	0.63	1.28	0.86	2.73	.63	.38
Log Regression	0.58	1.36	0.92	2.00	.47	.22
GoM	0.38	1.33	0.59	2.81	.79	.28
CART	0.42	1.29	1.09	2.52	.62	.33
80th Percentile of Error						
Regression	0.87	1.16	1.22	0.96	.14	.05
Log Regression	0.81	1.12	1.03	1.73	.27	.17
GoM	1.06	0.91	1.19	0.54	.20	-.08
CART	0.87	1.13	0.98	1.34	.16	.08

NOTE: All measures of accuracy in this table are ratios of the test statistic for the subsample for the model in question divided by the test statistic for that model for the full sample, as given in Table II.1. Thus, for example, the R measure for CART for the nursing only subgroup is 15 percent greater than the R measure for the full sample (.994, from Table II.1), whereas the R measure for the group receiving all three types of services was 15 percent less than that of the full sample for CART. The log regression model exhibited greater stability across subgroups on the R measure than did the other models.

[a]The average absolute difference is calculated as the mean of the absolute difference of the ratios from 1.0 for the four subgroups.

[b]The average difference is one-fourth of the sum of differences from 1.0 for the four subgroup ratios.

mix, the average absolute error is 19 percent for this model. All of the models except log regression underpredicted costs for the two categories of patients using aides and all overpredicted costs for the two categories of patients who did not receive aide visits, but the size of the errors varied substantially across models.

For the other measures of fit, the results are mixed. On the RMSE criterion the four models do substantially worse for some skill mix subgroups than for others, but none of the models is noticeably better than the others in providing a comparable fit across subgroups. The average absolute deviation from 1.0 is about .20 for each of the models, implying that on average their performance for a subgroup is 20 percent better or worse than their overall fit, as measured by RMSE. On the mean absolute deviation (MAD) measure, GoM provides the most comparable fit across subgroups by a modest margin. Log regression does noticeably worse than the others. Log regression and regression perform more evenly across subgroups on the MPAD measure. Log regression has the most balanced performance across subgroups in terms of the size of error at the 20th percentile, but has the most uneven performance across subgroups at the 80th percentile. The parsimonious regression model has the most balanced performance at the 80th percentile. CART does neither particularly well nor poorly in terms of balanced performance across subgroups on either of the distributional measures.

2. Subgroups Defined by Actual Cost

One of our key concerns is avoiding both systematic underprediction for patients requiring extensive care and systematic overprediction for patients requiring minimal amounts of care. To test the relative performance of the models on this criterion, we defined three subgroups based on their actual (standardized) costs incurred: episodes with actual cost below $500 (about 38 percent of the sample cases), between $500 and $1,500 (43 percent of the sample), and greater than $1,500 (the top 19 percent).

The results, displayed in Table II.3, show that all of the models have very unbalanced prediction errors across subgroups. As noted above, since the overall R measure is essentially 1.0 for each of the models, ratios for the R statistic in Table II.3 measure the ratio of average predicted cost to the average actual cost for cases in the subgroup. The results imply that the models underpredict costs for the high cost cases by 29 to 44 percent and overpredict low cost cases by 100 to 146 percent.

The log regression model yields more balanced prediction errors than the other models when the R measure is used, but there is little difference between the models on the other goodness-of-fit measures in Table II.3. Parsimonious regression model yields the second best performances on the R measure; CART and GoM are substantially worse. Log regression yields a somewhat less balanced fit across subgroups than do the other models on the mean absolute deviation measure, but a slightly more balanced fit when absolute deviations are measured in percentage terms.

Although the pattern of under- and overprediction of costs observed across subgroups defined by actual cost is inevitable, the **magnitude** of these errors is of some concern. High cost cases are comprised of an unusually high proportion of cases with positive disturbance terms, to use the language of regression. That is, these cases will be more likely to have unmeasured characteristics or events that yield higher costs than would be expected from their measured characteristics. This relationship will hold regardless of whether a holdout sample or the estimation sample is used to measure accuracy. Thus, estimates based on measured characteristics will always underestimate the average costs of a subgroup of individuals defined by their actual costs. Similarly, models for the full population will over-estimate costs for a set of individuals defined by their low actual cost, because they will have an over-representation of individuals with negative disturbances. The degree of the over- or underprediction for the two extreme groups may be greater or smaller for some models than others, but the direction is pre-ordained.

Note, however, that this result does not imply that agencies with an atypically high proportion of high cost cases should expect to be under-reimbursed. If an agency's average costs are higher than

TABLE II.3

MEASURES OF RELATIVE ACCURACY FOR SUBGROUPS
DEFINED BY ACTUAL COST

	Under $500	$500-$1,500	Above $1,500
Number of Observations	**471**	**528**	**234**
R			
Regression	2.14	1.11	0.63
Log Regression	2.01	1.05	0.71
GoM	2.35	1.10	0.58
CART	2.46	1.09	0.56
RMSE			
Regression	0.65	0.63	1.87
Log Regression	0.52	0.63	1.95
GoM	0.71	0.56	1.88
CART	0.68	0.57	1.90
MAD			
Regression	0.76	0.74	2.07
Log Regression	0.64	0.72	2.35
GoM	0.84	0.65	2.13
CART	0.82	0.64	2.17
MPAD			
Regression	1.85	0.50	0.42
Log Regression	1.77	0.51	0.55
GoM	1.96	0.41	0.41
CART	1.95	0.40	0.43

NOTE: All measures of accuracy in this table are ratios of the test statistic for the subsample for the model in question divided by the test statistic for that model for the full sample, as given in Table II.1. Thus, for example, the R measure for the regression model for the "under $500" subgroup is over twice as large as the R measure for the full sample (.994, from Table II.1), whereas the R measure for the subgroup with actual costs above $1,500 was 37 percent less than that of the full sample for the regression model.

other agencies because it has a higher proportion of **unpredictable** cases than in the population, the agency would be undercompensated. In contrast, if average costs per episode are high because the patients in that agency are more likely than other patients to have measured characteristics associated with high costs (e.g., received home health care during preceding 6 months), the predicted cost for the agency will be higher than that of other agencies. Thus, there is no reason to assume that simply because average standardized costs are greater in one agency than in others that this agency will be undercompensated.[4]

D. EFFECTS OF PROSPECTIVE PAYMENTS ON SMALL AGENCIES

Since estimated costs are not likely to be particularly accurate for individual episodes, small home health agencies are likely to have greater variability in net income under prospective reimbursement than under cost reimbursement. Agencies should receive correct compensation on average, but since there will be differences between actual and predicted cost for individuals, there will be some variation in the predicted average cost of an agency's patients around the actual average cost, and therefore variation in the agency's net income. Other things being equal, agencies with more episodes will have a lower probability of substantial differences between cost and payments than agencies with fewer episodes, since having a large number of episodes makes it more likely that those for which the agency is under-reimbursed will be balanced by over-reimbursement for other episodes.

To illustrate the variation in payment errors for agencies of different sizes we use simulations to compare the accuracy of the estimators for small, medium, and large agencies. Most home health agencies are fairly small. During fiscal years beginning between October 1985 and September 1986, the median-sized urban agency performed 8,604 home health visits. An agency at the 25th percentile performed 3,884 visits and an agency at the 75th percentile performed 18,457 visits (see Schmitz,

[4]Agencies' susceptibility to underpayment is lessened further by the nature of the case mix adjustor. Under the current design, an agency's per episode payment will differ from the agency's own base period average cost per episode (adjusted for inflation) only if the agency's mix of patients changes from the base period mix.

1990). Assuming that each episode requires 20 visits, agencies at the 25th, 50th, and 75th percentiles had approximately 200, 430, and 925 episodes per year, respectively. We will refer to these sizes as small, medium, and large. These assumed values are purely for the purpose of illustration; the current size distribution of agencies may be quite different from that of 1985-86.

1. Simulation of Prospective Payment System

Because the holdout sample is not that large (N=1,233), we used a procedure called the "bootstrap" to generate a distribution for our measures of accuracy by agency size. Under the bootstrap, each case in the initial holdout sample was replicated about 4,000 times to create a sample of over 4 million observations. We then drew 5,000 random samples of 200 cases each from this sample to simulate the experience of a small agency. For **each** of the 5,000 samples, the same measures of accuracy used earlier were calculated. We then examined the distribution of measures of accuracy for the 5,000 samples to describe the probable experience of small agencies. A similar process was used to create samples of 430 and 925 patients to simulate the effects of prospective payments for medium and large agencies.[5] This simulation procedure has the added advantage of controlling the mix of patients, so that estimated differences between large and small agencies are not due to systematic differences in the types of patients treated.

The R measure is the most interesting of the statistics because it is the cost recovery rate, the ratio of total reimbursement to total cost incurred if agencies were paid an amount equal to predicted cost for each patient. The 10th percentile of R, for example, will tell us that we would expect 10 percent of agencies of the given size to have a cost recovery rate lower than this value. Similarly, the 90th percentile of R tells us that 10 percent of agencies of the given size are likely to have a cost

[5]The actual number of draws varied by agency size. For small agencies, 5,000 samples were drawn. For medium sized agencies, 2,500 samples were drawn. For large agencies, 1,200 samples were drawn. These numbers of samples were determined by observing the number of replications necessary for the results to stabilize.

recovery rate above this value. Table II.4 displays the mean and standard deviation of the R measures obtained for each of the four models for the simulated samples.

The mean value of R is very close to 1.0 for all of the models except log regression, which over-predicts costs by about 2.5 percent. The average R values are very similar for agencies of different sizes, indicating that **on average** agencies should receive the correct payment regardless of size, except for the log regression model, in which agencies of different size would be overpaid by approximately the same percentage.

The standard deviations of the R ratio, however, are over twice as large for small agencies as for large agencies. Thus, we would expect many more agencies to be overpaid or underpaid by significant margins among the smaller agencies. To illustrate this, we have used the estimated means and standard errors to estimate the proportion of agencies in each size subgroup that we would expect to be underpaid by at least 5 percent and the proportion that would be overpaid by at least 5 percent if agencies were paid the amounts predicted by the model for individual patients. This is not how the case-mix adjuster currently under consideration for the per episode demonstration would be implemented, but this assumption facilitates the illustration here. Results are displayed in Table II.4 for each of the models.[6]

For the regression, CART, and GoM models the results show that about 20 percent of small agencies would be underpaid by 5 percent or more, but only 5 to 8 percent of the large agencies would expect to experience revenue shortfalls this large. At the other extreme, 15 to 19 percent of small agencies would be overpaid by 5 percent or more but less than 2 percent of larger agencies would reap such gains.

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[6]Estimates of the percent of agencies that would be underpaid by 5 percent or more are obtained by assuming that the distribution of R is normal, with mean and standard deviation equal to those given in Table II.4. (The distributions of R from our simulations tend to follow approximately a normal distribution.) Thus, the probability that predicted costs are at least 5 percent below actual costs is estimated as the probability that R is less than .95. For small agencies, using the regression model, this probability is equal to the probability that a standard normal variable is less than (.95 - .997)/.055, or about 20 percent.

TABLE II.4

SIMULATED DISTRIBUTION OF THE RATIO OF AVERAGE PREDICTED TO AVERAGE ACTUAL COST FOR AGENCIES OF DIFFERENT SIZES

	Small (200 Episodes)	Medium (430 Episodes)	Large (925 Episodes)
Mean Ratio (R)			
Regression	.997	.995	.993
Log Regression	1.026	1.025	1.023
GoM	.992	.991	.988
CART	.998	.995	.993
Standard Deviation of R			
Regression	.0551	.0374	.0260
Log Regression	.0625	.0428	.0299
GoM	.0566	.0383	.0268
CART	.0588	.0396	.0273
Expected Percent of Agencies with Predicted Cost 5 Percent or More Below Average Cost			
Regression	20 %	11 %	5 %
Log Regression	11 %	4 %	1 %
GoM	23 %	14 %	8 %
CART	21 %	13 %	6 %
Expected Percent of Agencies with Predicted Cost 5 Percent or more Above Actual Cost			
Regression	17 %	7 %	1 %
Log Regression	35 %	28 %	18 %
GoM	15 %	6 %	1 %
CART	19 %	8 %	2 %

The results for the log regression model are strikingly different. Because the model overpays on average, agencies of all sizes are much less likely to experience revenue shortages. Only 11 percent of small agencies and less than 1 percent of large agencies would lose over 5 percent. However, over **one-third** of the small agencies would expect to be overpaid by at least 5 percent. Even among the large agencies, 18 percent would experience windfall gains exceeding 5 percent.

These results indicate that small agencies would indeed be at substantial risk of significant underpayment if the payment to agencies were based on any of these models, although they also have a nearly equal probability of being overcompensated by a comparable margin. If the log regression model were used, many agencies, regardless of size, would be substantially overpaid.

It is useful to keep in mind, however, that the payment methodology under consideration for the per episode demonstration would not pay agencies according to this measure, but rather would use this adjustor to calculate an appropriate **change** in the payment rate relative to the base year rate to reflect changes in the agency's patient mix. This difference greatly lessens the impact of the adjustor and makes overpayments or underpayments much less than the above results imply, under any of the models and for any agency size. However, the results do illustrate the differences between large and small agencies in the likelihood that the adjustment mechanism will fail to adjust accurately for changes in case-mix. They also illustrate the relative size of errors made by the different models.

E. CONCLUSION

1. Similarity of Overall Performance Across Models

Overall, the four most promising models yield fairly similar measures of accuracy. Predicted costs on average for the sample are quite close to the average actual cost, regardless of which model is used. The mean absolute deviation statistic was only about 7 percent greater for the worst model than the best model. Even for the measure with the most difference, the root mean squared error, the maximum value was only about 12 percent higher than the minimum for the four models.

The relative similarity of the fit of the models is reflected in the fairly high correlations of their predicted values (Table II.5). The parsimonious regression and log regression estimates are the most highly correlated (r = .88), CART is somewhat less highly correlated with the two regression models (r = .77 and .68), and GoM shows the weakest correlation with the other models (r = .41 to .58).

The overall similarity of the parsimonious regression, log regression, and CART models is due in large part to the similarity of the fitting criteria and to the heavy dependence of all three models on a particular set of variables (the relative importance and statistical significance of particular variables in GoM is not easily determined). These variables are:

- Whether treatments included home health aide services
- Whether treatments included therapeutic exercise from a physical therapist
- Whether treatments included nursing for open wound care
- Whether treatments included venipuncture
- Number of hospital admissions during the home health care episode

As noted earlier, all but one of these critical variables pertain to the treatments "required" (that is, either actually received or planned), and the other variable (hospital admissions) refers to events occurring after admission. None of the variables found to be important in all three models measured patient characteristics at admission.

Several other variables were also found to have large and significant effects in both the log regression and parsimonious regression models, which may explain the high correlation between the predicted values from these two models. Three of these variables are of the patient's response-to-care measures; one is a prior use measure; one is another indicator of the type of nursing care required; and one variable captures the effect of truncation of the episode:

- The number of patient problems that were resolved during the home health episode

TABLE II.5

CORRELATIONS BETWEEN PREDICTED VALUES OF THE VARIOUS MODELS

	Regression	Log Regression	CART	GoM
Regression		.88	.77	.58
Log Regression	.88		.68	.47
CART	.77	.68		.41
GoM	.58	.47	.41	

- The number of patient problems for which there was improvement (but not complete resolution) by the end of the home health episode

- Whether the number of ADL dependencies was greater at the end of the home health episode than at the beginning

- Whether the treatments included skilled nursing to teach diabetic care

- Whether the patient used home health service in the six months prior to the episode

- Whether the home health episode was ended because of death, transfer to a nursing home, refusal of care, or a move out of the agency's service area.

2. The Most Desirable Models: Regression and CART

Despite the general similarity on many of the overall measures, parsimonious regression and CART are perhaps the most desirable models. The parsimonious regression model does the best overall by almost all of the measures of accuracy. The ratio of predicted to actual cost (R) is close to one for regression, so there is no systematic bias toward over- or under-reimbursement. Regression does well in the subgroup analysis and it has the smallest variation in cost recovery in the simulations conducted for agencies of all sizes. CART's major advantage is its small data requirements, since the model uses only 12 variables to classify patients into one of 16 reimbursement cells. It is not much worse than regression on any of the measures of accuracy, and exhibits no systematic bias on average towards over- or under-reimbursement.

The other two main models have different strengths and weaknesses. The log regression model performs very well on many of the measures of fit, but it has three major deficiencies: a large root mean squared error, predicted costs somewhat greater than actual on average, and substantially greater variability in predictive accuracy for agencies of any given size. GoM also does well but not as well as the parsimonious regression model. Given its greater complexity and substantial data requirements, it should perform better than regression if it is to be given serious consideration.

III. IMPLEMENTING A CASE-MIX ADJUSTOR

In proposing a case-mix adjustor for the per episode demonstration, the accuracy of the predictions from the statistical model is only one of the factors to be considered. Accuracy is important both to avoid over-payments and under-payments to agencies and to minimize incentives for agencies to shun certain types of patients. Equally important, however, is the administrative feasibility of using the adjustor in practice, the cost of collecting the data needed to calculate the adjustor, the "gameability" of the adjustor, and the acceptability of the adjustor to agencies on intuitive grounds. An adjustor that requires data that will not be available until long after the episode has been completed (e.g., MADRS) or requires the agency to submit data items that are costly to collect or process will be unwieldy, unworkable, and unacceptable to agencies otherwise inclined to participate in the demonstration. The adjustor will also be doomed to failure if it is too easy to subvert it, that is, if agencies can manipulate the data on which the adjustor is based so as to procure for themselves a greater payment but no greater costs. Finally, if the agencies do not understand the adjustor at least somewhat, they will not trust it to protect them from adverse changes in their case-mix. This, in turn, may well convince some agencies to abandon the per episode demonstration.

Another factor that must be considered in recommending adjustors is how to weight the various measures of the accuracy of the prediction. We have examined a number of different statistical criteria for measuring how accurately the models predict, and whether they do so equally well for different subgroups of patients or agencies. The importance given to the different criteria could alter the selection of models.

A. HOW THE ADJUSTOR WOULD WORK

One might ask whether **any** of the estimated models yields sufficiently accurate estimates of costs to be used in creating a case-mix adjustor. After all, the absolute error is about 85 percent of the actual cost on average, even for the best models, and the proportion of variance explained by any is only about 35 percent for the estimation sample and 20 percent for the holdout sample.

In answering this question it is useful to bear in mind the manner in which the model would be used to adjust agency payments. First, as noted in the previous chapter, the model would not be used to pay agencies the predicted amount for each patient served. The method currently under consideration for the per episode demonstration is one that offers as much protection as possible to the agencies without eliminating all adverse consequences of failing to control costs. Each agency will be paid the average cost per episode that it incurred during a base period preceding the demonstration, adjusted for inflation and multiplied by a factor to account for changes in case-mix.

The case-mix adjustment factor for adjustors based on classification models like CART or AUTOGRP is defined as

$$\sum W_i^1 C_i^0 \;/\; \sum W_i^0 C_i^0$$

where W_i^1 is the proportion of the agency's cases in the ith case-mix cell in the demonstration year, W_i^0 is the same proportion for the base period, and C_i^0 is the average base year cost per episode in the ith case-mix cell for **all** agencies. (Agency-specific cost weights could be used but it is doubtful that most agencies will have enough cases of each type in the base period to yield accurate weights.) This formula works fine for CART but must be modified somewhat for regression, since individuals are not classified into cells but rather given an estimated cost, based on their characteristics and the estimated parameters of the model. Thus, the case-mix adjustment factor based on a regression model of some form rather than a classification method would be defined as

$$\sum \bar{X}_j^1 b_j / \sum \bar{X}_j^0 b_j$$

where $\bar{X}_j^1$ is the mean value of the jth explanatory variable for patients in the demonstration year, $\bar{X}_j^0$ is the corresponding mean for patients in the base period, and b_j is the estimated regression coefficient on the jth variable.

The formulas are analogous--the coefficients b_j are simply cost weights like C_i for patients with the characteristic in question and the mean values are analogous to the proportion of sample members in a category. In fact, if patients were assigned a set of mutual exclusive and exhaustive binary variables indicating the CART cell into which they were classified, and cost was regressed on this series of variables, the coefficients resulting from this regression would be the cost weights (C_i^1's) and the mean of the binary variables designating classification cell would be the proportions (W_i^1 and W_i^0).

An example will illustrate why even sizeable errors in the model estimates of cost do not necessarily translate into large payment errors. First, note that if the distribution of patient characteristics does not change (i.e., $W_i^1 = W_i^0$ or $\bar{X}_j^1 = \bar{X}_j^0$) between the base and demonstration period, the agency's payment will be unaffected, even if the average cost factor for cases in a given cell (or the coefficient for a given characteristic) are greatly in error. Secondly, even if the distribution does change considerably, the errors will be dampened by the nature of the adjustment factor.

To see this, consider the following example, which is oversimplified but quite consistent with the results presented in the previous chapter. Suppose that there are three types of patients: low cost patients, who cost $250 to serve and who comprise 40 percent of the agency's patients, medium cost patients, who cost $1,000 and comprise 50 percent of the caseload, and high cost patients, who cost $4,000 and comprise 10 percent of agency patients. The overall average cost per episode is then $1,000.

Suppose that the model overestimates costs for the low cost cases by 100 percent (i.e., estimates $500), correctly estimates costs for the middle group and underestimates costs for the high group by 25 percent (i.e., predicts $3,000). Then average predicted cost is still $1,000; the model estimates correctly on average. However, if the distribution of cases changes during the demonstration such that 15 percent of the cases (instead of 10 percent) are now in the high cost group and only 35 percent (instead of 40 percent) are in the low cost group, the agency's average cost will increase to $1,187.50, but the predicted cost will increase to only $1,125. The adjustment factor is 1.125 (1,125/1,000), but costs have actually increased by a factor of 1.188, and the agency will lose $62.50 per episode (about 5.3 percent of the cost).

Although this is a substantial loss due to underpayment, it has been generated under the assumptions that: (1) there is a very large (50 percent) increase in the proportion of expensive patients, (2) the increase comes about from a reduction in the proportion of cases that are least expensive, and (3) none of the increase in costs is associated with a change in patient characteristics. If half of the increase in high cost patients are individuals with observable characteristics associated with high cost, the magnitude of the underpayment is cut in half. The loss is also smaller if the increase in the proportion of high cost cases arises from a reduction in the share of medium cost cases rather than the share of low cost cases.[1] Thus, the sizeable errors on predictions for subgroups will generate much smaller errors in the payment rates for agencies because of the way the model predictions are incorporated into the adjustor.

B. STRENGTHS AND WEAKNESSES OF RECOMMENDED ADJUSTORS

As we indicated in the previous chapter, the best candidates for use as a case-mix adjustor are likely to be obtained from a parsimonious multiple regression model with actual (not logged) cost as the dependent variable or from CART. The Tobit model performed well on a number of measures

[1]In this case average payment would be $1,100, actual cost would be $1,150, and the loss per episode would be $50 (about 4.4 percent).

but was rejected because it systematically overpredicts costs by a significant amount (nearly 6 percent). The log regression model was also rejected, despite providing the best fit for certain subgroups and the most consistent performance across subgroups. It too overpredicted costs (though by a much smaller margin, about 2.3 percent), and had a much higher root mean squared error than regression. Using the log regression model wou 'd result in substantial overprediction of costs for a high proportion of agencies, especially small ones. AUTOGRP, which is a grouping model similar in design to CART, was rejected because it produced consistently less reliable estimates than CART. The GoM model was rejected because it produced less accurate predictions than the parsimonious regression model and is much more cumbersome to use and difficult to explain.

1. The Parsimonious Regression Model

This regression model consistently yielded the best fit for the full sample regardless of the accuracy criterion used. It also did better than the other models, except log regression in some instances, in predicting costs for subgroups of the sample defined by patient characteristics. Our simulations showed the regression model to have substantially less variability in accuracy than the log regression model, a factor particularly important for small agencies.

One minor problem with the regression model was that it produced a small number of negative or very low predicted values. Although this was easily dealt with by setting a minimum rate per patient (equal to the cost of one skilled nursing visit), it is somewhat ad hoc.

A more serious concern with the regression model is the data burden and difficulty explaining the model to agencies. Although regression is much easier to explain than GoM or Tobit, it is not an intuitive concept to home health agency staff. Furthermore, there may be some anomalous coefficient values that imply lower payment for patients with certain conditions or characteristics that agency staff would normally associate with higher costs. We believe that these problems can be dealt with through simulations and preparation of educational materials and examples, but it will require some effort.

The preferred (parsimonious) regression model includes 64 variables for which data will have to be gathered. This may be a significant burden on agencies. However, most of the variables are ones that agencies already collect, either because they are required for the plan of treatment forms (HCFA form 486) or because the agency needs the information to develop an adequate care plan. The variables in the model can be grouped as follows:

Type of Variable	Number of Variables
Comorbidities	6
Demographic	2
Care groups	12
Equipment and supply use	5
Sensory, cognitive, and other limitations	3
Severity of illness	2
Treatments	24
Nursing interventions	4
Response to care	5
Truncation of episode	1
TOTAL	64

The 50 comorbidity, care group, equipment, limitations, and treatment variables are all constructed using data elements currently required on forms 485/486 (although the requirement that these forms be submitted to fiscal intermediaries may soon be dropped). One of the demographic variables, age, is also available from this source. Of the remaining 13 variables, 4 would be relatively easy to obtain, but the other 9 are likely to be very difficult. The 4 nursing intervention variables, which were defined by the Georgetown project, would be relatively easy to obtain by including a small number of additional variables on the 485/486 forms. These variables are indicators of whether the

nurse developing the plan of treatment believes that the patient will need certain types of care that are not already captured on the 485/486 forms.

The 9 more difficult variables to collect are the five response-to-care variables, whether the episode was truncated (e.g., by death or admission to a nursing home), Medicare eligibility (a demographic variable), and the two severity of illness measures (number of home health visits received in the 6 months prior to admission and the number of hospital stays during the episode). The response-to-care variables require assessment of change in ability to perform activities of daily living (increase or decrease in number of ADL impairments), and the status at discharge of patient problems present at the time of admission. Collecting these measures is likely to be expensive and infeasible.

Fortunately, regression models excluding the response-to-care and truncation variables yield cost estimates for the holdout sample that are only slightly less precise than estimates obtained from the full regression model. The root mean squared error statistic increases by only about 1.6 percent, and the mean absolute deviation and mean percentage absolute deviation statistics increase by 3 and 5 percent, respectively. (See Chapter VI for more details.) These marginal gains in predictive power suggest that any case-mix adjustor used in the per episode demonstration will not rely on these expensive variables.

2. The CART Model

The CART model has just the opposite strengths and weaknesses as regression. It does not perform as well on any of the measures of accuracy used, except that it predicts correctly on average. However, it does not perform **markedly** worse on the summary measures of accuracy. Furthermore, it is very easy to describe how it would work, and it requires data on many fewer variables.

The CART model would be relatively easy to use as a case-mix adjustor. The model that we fit to the Georgetown data identifies 16 categories of patients, defined by the values of only 12 variables. The distribution of patients across these 16 categories would be calculated for each agency for the

base period and for the demonstration period and used to construct the index. The cost weights for each category would be simply the average cost per episode for cases in that category, which would be obtained from another source (e.g., the per visit demonstration).

The data items that our CART model relies upon would generally be easy for agencies to obtain and thus would pose little burden for them. Eleven of the 12 variables are treatments, care groups, or equipment and supply variables all of which are based on data already being recorded by agencies on 485/486 forms. No response-to-care variables are included in the final CART model, and the only severity of illness variable required is the number of times the patient is admitted to the hospital during the episode. Even this variable could probably be provided fairly easily by agencies, since it pertains to the agency's existing patients and would require little tracking of patients. The CART tree is also only weakly dependent upon this variable--less than 3 percent of the sample are split off the main CART tree on this variable, suggesting that the fit of the model would not change greatly if this variable were deleted from consideration.

Despite the ease of administration and the intuitive appeal of the CART model, however, the model's simplicity may also be its weakness. The model's fit overall is reasonably close to that of regression, but it overpredicts substantially for patients requiring very few services, and underpredicts for heavy users of services. This result holds regardless of the individual patient's characteristics, since the minimum payment cell for CART is $538 and the maximum payment cell is $2,884. Thus, agencies would benefit by increasing their share of patients requiring minimal services (e.g., less than about 9 nursing visits) and decreasing their share of those requiring extensive care (anything expected to cost over $3,000, which is equivalent to three nursing or therapy visits per week for the maximum 120 day period). Although the results in Chapter II suggest that all of the models underestimate for high costs cases and overestimate for low cost cases, the fact that payment rates for specific types of patients are bounded and known makes it easier for agencies to select patients that fit certain profiles.

C. A HYBRID MODEL

One approach that we have just begun to explore is a hybrid of the CART and regression models. Under this approach we will estimate a regression model for each of the sizeable classification cells to further reduce the within-cell variance. Patients from the base and demonstration periods would then be assigned a predicted cost based on the regression model for the cell in which they had been classified by CART, rather than being assigned the cell mean. This approach could be particularly useful for reducing the extent of overpayment of low cost cases, since most such cases are in the CART cell with the lowest reimbursement rate and the highest proportion (43 percent) of episodes. By varying reimbursements to patients in this cell we may eliminate some of this overpayment.

Our hope is that the hybrid model will provide a case-mix adjustor with the strengths of both CART and regression and few of their weaknesses. The advantages of this approach are that accuracy would be increased at least somewhat, and it would be more difficult for agencies to manipulate their case-mix to obtain a case-mix adjustment factor that overstates their actual expected cost increase. We would avoid one of the major disadvantages, increased burden on agencies, by limiting the set of variables used in the regression to ones that are readily available. Unfortunately, the advantages to the hybrid estimator come at the cost of increased complexity. We will seek to minimize this complexity by severely limiting the number of variables used in the cell-specific regressions, and performing regressions only for the CART cells that are relatively large.

IV. RECOMMENDATIONS FOR FURTHER ANALYSIS

In this chapter, we present our recommendations for a strategy for the remainder of the work required to develop a case-mix adjustor--including, but not limited to, the analysis of the demonstration data. These recommendations draw upon the results of our exploratory analyses with the Georgetown data. We recommend that the strategy for further work focus on: (1) pursuit of the variables and analytic techniques that proved most promising with the Georgetown data; (2) the development and assessment of approaches to minimize the disadvantages of these analytic techniques; and (3) the investigation of issues that can be explored with the data collected in the demonstration but which could not be explored, or only partially explored, with the Georgetown data.

A. MOST PROMISING VARIABLES AND TECHNIQUES

In this section, we present our recommendations regarding explanatory variables and analytic techniques.

1. Explanatory Variables

One of the strongest relationships we found was that including retrospective variables in the model consistently yielded far better estimates of home health costs than models than were restricted to prospective variables. For example, as described in Chapter VII below, the adjusted R^2 for the basic regression model including prospective variables only is .14 and that for a comparable model including both retrospective and prospective variables is .36. Moreover, one type of retrospective variable, treatments planned or received, dominates the CART and AUTOGRP models. Another retrospective variable, number of hospital admissions during the home health episode, is also important in the CART, AUTOGRP models, and regression models. (See Chapters VII through IX.) Given the dominance of the retrospective variables, we recommend no further pursuit of models restricted to prospective variables.

However, further analysis of the treatment variables is indicated to identify to what extent measures of treatments planned, rather than treatments **planned or received**, predict home health resource use. As described in Chapter VI, the Georgetown data on treatment combines information on treatments planned or received in such a way that they cannot be distinguished. The demonstration data will measure planned treatments only. Measures of planned treatments are preferable, other things equal, because measures of received treatments shifts payment back toward cost reimbursement. Moreover, agencies are already required to provide data on planned treatments, but not on treatment received, so the latter would place additional burden on agencies. For the case-mix analysis with the demonstration data, we plan to construct measures of treatments planned at admission and for successive 60 day certification periods as applicable.

A further analysis is also needed to determine the importance of other variables, some prospective and some retrospective, that are important for predicting costs but would not be simple to collect. As pointed out in Chapter III, such variables include the following:

- The number of hospital admissions occurring during the episode
- Medicaid eligibility
- Change in number of ADL impairments
- Resolution of patient problems
- Whether the episode truncated.

Variables constructed from each of these data items were found to be important for the regression model, although the loss in precision from dropping the response to care and truncation variables (the last three in the list above) was modest. However, we will need to investigate the cost in accuracy from dropping the prior home health visits, prior hospital admissions, or Medicaid eligibility variables, since these will all be somewhat onerous to collect in a way that will yield accurate and timely data.

2. Analytic Techniques

As we noted in Chapter III, we recommend pursuing case-mix adjustors based on just two analytic techniques--multiple regression and CART. At this juncture, it would be premature to select a single analytic technique--either multiple regression or CART. These two techniques have contrasting advantages and disadvantages, and as yet we have not fully explored ways in which the disadvantages of each might be overcome. We also intend to explore the hybrid model discussed in Chapter III.

B. MINIMIZE DISADVANTAGES

We have explored a variety of approaches to ameliorate some of the disadvantages of an adjustor based on multiple regression--very small or negative costs weights and the types of variables involved. However, we have not yet explored how to minimize the difficulties associated with gaining agency acceptance for a case-mix adjustor based on regression. Moreover, we have not yet fully explored ways in which to improve the accuracy of case-mix adjustors based on CART for episodes involving very few visits.

1. Gaining Acceptance for Regression-Based Approach

Assuming that the two case-mix adjustors were equally accurate in predicting cost, the acceptance of a case-mix adjustor by home health agencies of a regression-based adjustor compared to a CART-based adjustor will depend on five major issues: (1) ease with which agency staff can understand explanations of how the adjustor was derived; (2) the extent to which the individual coefficients in the regression model are anomalous; (3) whether the cost weights for different types of patients are reasonable and reflect clinically meaningful differences in care; (4) the amount of burden that agencies will experience to collect the required data; and (5) ease with which agencies can determine the payment implications of a change in case-mix.

We present a suggested approach to investigation of each of these five issues below. Some of the work we recommend may be more appropriately undertaken by the demonstration contractor for the evaluation, Abt Associates, than by Mathematica Policy Research, as evaluation contractor. Our purpose here is to present recommendations for the work yet to be done.

a. Intuitive Explanation

The intuitive explanation for a case-mix adjustor based on CART is straightforward; it divides patients into groups with similar costs. While regression models in which all of the explanatory variables are categorical could also be described as a grouping procedure, the number of groups involved is too large in practice for this explanation to be compelling.

A better approach is likely to be to describe the case-mix adjustor based on regression as a score; the higher the score, the greater the cost weight and the greater the payment for a case. The score is based on a number of the characteristics of a given case. These characteristics are of varying importance in determining the score. To take this varying importance into account, each characteristic is given a different weight--some positive, and some negative. These weights are summed to obtain the overall cost weight.

To explore the relative ease of understanding of these two explanations, we plan to present them to the clinical advisory panel for case-mix for the demonstration.

b. Anomalous Coefficients

Individual coefficients might be considered anomalous by home health agency staff because their direction or relative magnitudes were inconsistent with expectations based on clinical considerations. As described in Chapter VII, there are a few coefficients for our basic regression results that are inconsistent with our prior expectations. These anomalous results may be caused by correlation with other variables in the regression models, which we have not yet fully explored.

We plan to ask the clinical advisory panel to review the regression results and indicate which (if any) they find anomalous. We will then explore the patterns of simple and multiple correlation between the variables with anomalous coefficients and other variables in the model. Further, we will investigate the effect of the deletion of the variables with anomalous coefficients on the coefficients of other variables in the model and on the acc acy of predicted costs in the holdout sample.

c. Reasonableness of Cost Weights

The cost weights from both the regression-based and the CART-based models must be reasonably consistent with clinical expectations if the resulting case-mix adjustors are to gain the acceptance of home health agencies. We believe that it would be useful to develop case vignettes based on the Georgetown data, calculate the regression- and CART-based cost weights for these cases, and ask the members of the clinical advisory panel to review both the vignettes and the cost-weights.

As noted above, the regression model requires data on a number of variables that are not readily available and would be expensive to collect. The CART models require information only on treatments planned or received, plus data on hospital admissions during the episode.

However, the fact that the CART models use fewer retrospective variables does not necessarily imply that the data collection required to support regression-based adjustors would be much more expensive and burdensome than that required to support CART-base adjustors. If completion of an additional standardized instrument is required (for example, at patient discharge) for both adjustors, the inclusion of additional items needed for the regression-based adjustor might be only marginally more costly and burdensome.

Our suggested strategy to address this issue has two foci. First, we suggest investigation of alternative sources for the data on treatments and hospital use during the home health episode needed for both the regression and CART models. We already plan to investigate whether the data on planned treatments from the existing programmatic data is sufficient, and we suggest that we also

investigate the length of the delays that would be required to obtain data on hospital use during the home health episode using the new National Claims History files, which promises to greatly reduce the length of time between service receipt and the availability of data on these services. Second, we suggest consideration of the development of a brief standardized instrument to collect information about events after admission to home health care, which would be completed by home health agency staff participating in the per episode demonstration. Experience with this instrument (even for a sample of cases) would permit us to assess the burden associated with additional data collection and any difficulties associated with responding to particular items, including those required only in the regression models.

e. Agency-Specific Estimates of Payment Change

Finally, agencies are more likely to accept either a regression- or CART-based adjustor if they have an estimate of the magnitude of change in their payments they can expect if they participate in the per episode demonstration. Although this cannot be determined precisely without knowledge of how the agency's case-mix will change, an estimate can be obtained by showing how reimbursement would have changed in response to past changes in an agency's case-mix.

Since one cannot assume that home health agencies will have (or be readily able to obtain) sufficiently precise information on recent changes in their case-mix, our recommendation is to construct such estimates for them from HCFA data sources. It is our experience that senior staff of home health agencies have only a vague idea of recent changes in their case-mix, and in any case they would not describe the case-mix in a manner consistent with our models. (This recommendation assumes that the treatment plan variables that we will have in the demonstration data have comparable explanatory power to variables in the Georgetown data set measuring treatments planned or received.)

The key types of variables required for both the CART and regression models are treatments and hospital admissions during the home health episode. As described in Chapter III, these are the

most powerful of the explanatory variables in the models. Regardless of which type of adjustor is adopted, we will be able to develop useful estimates of change in payment using only these variables.

For the purpose of developing agency-specific estimates, the treatment data could be obtained from the Regional Home Health Database, and the data on hospital admissions could be obtained from MADRS. In contrast to the situation in an on-going program, the delays between service receipt and the availability of MADRS data are not a serious impediment for our purposes here. Moreover, MADRS data could also be used to construct measures of episodes using the standardized definition adopted for the per episode demonstration.

2. Improving CART Predictions for Those Using Few Services

The lowest mean cost for any case-mix group defined by CART is $550, an amount that considerably exceeds the standardized cost of a single nursing visit ($59). Moreover, the number of patients classified in this group is large, about 40 percent of the patients in the analysis sample. As described in Chapter III, we recommend the hybrid model in which standardized cost will be regressed on a subset of the explanatory variables for patients classified in this cell. We also will explore ways of addressing the low maximum cost-weight implied by the CART model, perhaps by defining cost or utilization outliners.

C. ISSUES THAT CANNOT BE EXPLORED WITH THE GEORGETOWN DATA

There are two types of issues that were not explored, or not fully explored, with the Georgetown data. These issues involve additional variables and defining home health episodes as bounded by either a hospital stay or a 30-day gap in home health billing.

1. Additional Variables

a. Informal Caregiving and Compliance

The Georgetown data base contains little information on two factors that may be important in predicting home health resource use: informal caregiving and patient compliance with treatment regimens. The only measures of informal caregiving available in the Georgetown data are whether or not the patient has a live-in or visiting caregiver; there is no information on compliance.

The demonstration database includes information on the ability as well as availability of informal caregivers and on a history of non-compliance with treatment regimens. We plan to include this information in the analyses developing a case-mix adjustor with the demonstration data.

In addition, detailed information on the amount and type of care actually provided by informal caregivers and on compliance with medication regimens is also being collected in interviews with a sample of 2000 patients. We will use the interview information to further investigate the effect on the use of home health resources of informal caregiving and non-compliance.

b. Disease Staging

We had originally planned to construct Disease Staging measures of severity of illness from diagnosis and procedure codes for hospital stays prior to and during the home health episode. However, we no longer think the expense involved in developing the Disease Staging measures is warranted.

There are three arguments which lead us to this conclusion. First, a number of other measures of severity of illness are already available. The demonstration database includes measures of health service use prior to during the home health stay, clinical instability at admission, and severity is taken into account in several of our care groups, which are based on the diagnosis and procedures codes giving rise to the need for home health care. Measures of severity of illness of several important comorbidities are also available for the home health patient interview sample. Second, prospective measures, including measures of severity of illness prior to the home health stay, are strongly

dominated by treatment variables. Thus, additional prospective measures of severity of illness are unlikely to increase our ability to predict the use of home health resources. Moreover, although the number of hospitals stays **during** the home health episode is an important predictor of home health resource use under our current definition of a home health episode, our plan is to investigate a definition of home health episode as ending whenever an intervening hospital stay of three days or more occurs. Under this definition, if home health care continued after discharge from the hospital such hospital stays would mark the beginning of a new home health episode, and measures of severity of illness associated with this stay would be prospective measures. Third, the Disease Staging measures of severity of illness are unattractive for use in an on-going program. The algorithms are complex, making them expensive to apply, and a licensing agreement is likely to be necessary.

2. Episodes Bounded by Hospital Stays

A home health patient who is admitted (or readmitted) to a hospital is likely to have substantially greater care needs than other home health patients and may have dramatically different care needs before and after the hospital stay. Georgetown data on the cost of home health care for patients with hospital stays of three days or more during the home health episodes confirms this. The total home health cost for such patients averages almost fifty percent more than that for all patients ($1375 compared to $939).

There are two obvious possible approaches to incorporating changes in patient care needs associated with a hospital stay in a case-mix adjustor. One approach is to include variables measuring hospital stays during the home health episode among the measures of patient characteristics and to calculate a single case-mix adjustor for home health care prior to and following the hospital stay. The other approach is to calculate separate case-mix adjustors for the periods for and after the hospital stay. These two periods might be treated as two episodes, with the agency receiving two payments or as a two-part episode with the agency receiving the larger of the payment amounts associated with the two parts.

Our analyses of the Georgetown data incorporates the first approach; however, we are unable to develop the second approach with the Georgetown database. We do not have the information that is required on the characteristics of patients following a hospital stay. Assuming sample sizes warrant, we plan to explore the second approach with the demonstration data, using those cases in which patients are readmitted to home health care following a hospital stay. Since about 7 percent of the cases on the Georgetown data set appear to be cases in which a patient who was receiving home health care was readmitted to home health care following a hospital stay, we estimate that we will be able to identify about 500 such readmissions with the planned demonstration sample of 8000 cases.

PART 2

DATABASE, CREATION AND SELECTION OF EXPLANATORY VARIABLES, AND RESULTS FOR INDIVIDUAL ANALYTIC TECHNIQUES

V. CONSTRUCTING THE DATABASE

The Georgetown data were collected for the Home Care Classification Project of the Georgetown University School of Nursing under a grant from HCFA. The principal investigator for the project was Virginia K. Saba.

Data on 8,961 patients were collected from 646 home health agencies operating under various types of auspices/control and in different regions of the country. Using an instrument developed by Georgetown University, agency staff abstracted information from clinical records for a sample of patients recently discharged by the agency. Information on the entire home health episode (as identified by the agency) was abstracted for the sampled patients. Agencies submitted between 5 and 50 completed abstraction forms. The data were collected over approximately a one year period from the Fall of 1988 to the Fall of 1989.

For this project, we merged the Georgetown data with HCFAs MADRS data (Medicare Automated Data Retrieval System). Our intent was to use the MADRS data to identify episodes of Medicare home health care which met the standardized definition of episode adopted for the project and to develop measures of use of other health services. We identified a large number of cases in which the episode on the Georgetown file was a partial episode under the standardized definition. These cases were excluded from our database.

During the process of merging the Georgetown and MADRS data, we also identified a number of problems with the data. We were able to resolve some of these problems; in other cases, we excluded the cases with problematic data from our database. This also resulted in the exclusion of a large number of cases.

A total of 2,866 cases on the Georgetown data set were excluded from our database, leaving a total of 6,095 cases for our Georgetown analysis and hold-out samples.

In this chapter, we first document the problems with the data, the procedures we followed to resolve them when that was possible, and the rules for deletion of cases with problematic data. Then we consider the treatment of partial episodes. Finally, we present the numbers of cases excluded under various circumstances.

A. PROBLEM IDENTIFICATION AND RESOLUTION

Some of the cases on the Georgetown data set involved non-Medicare patients and visits; these cases were problematic given the purpose of this study. Other problems involved internal inconsistencies in the Georgetown data and inconsistencies between the Georgetown and MADRS data.

1. Non-Medicare Patients and Visits

Home health per episode payment is to apply only to services covered by Medicare. Therefore, it is inappropriate to include data on non-Medicare patients and on non-Medicare visits in our analyses.

Although the Georgetown study was designed to collect data on Medicare patients, some agencies abstracted data on other patients and this data was included on the Georgetown data set. We excluded these cases.

Some Medicare home health patients receive non-Medicare visits; often these visits occur after the provision of services covered by Medicare. We wished to exclude such visits from our analysis. However, the Georgetown data set does not indicate which of the visits a patient received were non-Medicare visits. It includes only the number of non-Medicare visits. Our solution to this problem was to assume that non-Medicare visits follow Medicare visits. In cases with non-Medicare visits, we counted backward from the date of the last visit on the Georgetown data set to identify the date of the last Medicare visit. The latter date was used in defining the standardized episode in these cases. However, when the number of the non-Medicare visits was large, we were uncomfortable with the

assumption that all non-Medicare visits follow Medicare visits. Therefore, we excluded approximately 100 cases in which there were more than five Medicare visits according to the Georgetown data.

Although the Georgetown instrument indicated that the dates of **all** visits (Medicare and non-Medicare) were to be recorded, there were a small number of cases in which the number of visits not billed to Medicare exceeded the total number of visits for which dates were recorded. We excluded these cases from our database.

In addition, we excluded almost 400 cases in which the number of non-Medicare visits was missing.

Finally, there were some cases in which there were no MADRS records of home health bills within 30 days following the first visit date on Georgetown. In these cases, we questioned whether the initial visits on the Georgetown data set were Medicare visits. We excluded these cases.

2. Internal Inconsistencies

The type of internal inconsistency that occurs most frequently in the Georgetown data involves inconsistencies in the dates of admission, discharge, and visits. Although the admission date was defined in the Georgetown instrument as the date of the first visit, we identified a large number of cases in which the date of the first visit preceded or followed the admission date. Similarly, although the discharge date is defined on the Georgetown instrument as the date of the last visit or last contact, we identified a large number of cases in which the date of the last visit was later than the discharge date. There was no basis on which to resolve these inconsistencies case by case.

Our solution was to use the dates of the first and last visits, rather than the admission and discharge dates, to define episodes on our database. However, because the information on patient characteristics in the Georgetown was intended to describe the patient at admission, rather than at the time of the first visit, we excluded the cases in which the first visit date was more than 30 days before or after the admission date. We also excluded cases in which the dates of visits were missing.

We also excluded a relatively small number of cases in which successive visit dates were more than 60 days apart. Manual review of these cases suggested that one or more visit dates was in error.

We also identified some cases in which the procedure codes on the Georgetown database appear to be misjustified. For example, there were six cases of reopening of a wound of the thyroid field (code 0602). As this is a very rare procedure, most or all of these are probably cases of prostatectomy (code 6020). We rejustified the data as appeared appropriate in these cases.

3. Inconsistencies between Georgetown and MADRS Data

There were two types of inconsistencies between the Georgetown and MADRS data. First, there were a number of cases on the Georgetown file for which there were no Medicare records or no Medicare home health records. Second, there were a number of cases in which the number of home health visits according to the two data sets were inconsistent.

a. No Medicare Records or No Home Health Records

There were almost 1,000 cases on the Georgetown file for which we were able to identify no matching Medicare claims. These cases are of three types. First, they include a few cases in which the Medicare number was missing from the Georgetown data set. Second, they include cases in which there were no MADRS records for a Medicare number listed on the Georgetown data. We had no choice but to exclude these two types of cases from our database. Third, they include cases in which there were MADRS records which matched the numerical portion of the Medicare number listed on the Georgetown data (that is, the portion other than the alphabetical suffix),[1] but the sex and date of birth (or date of admission to home health care), on the Georgetown data did not match the sex and date of birth (or admission) on MADRS. We excluded these cases from our database, rather than risk matching Georgetown and MADRS data for different individuals.

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[1]In general, the numerical portion of a Medicare number is the Social Security number of the beneficiary under whose account the patient is covered. A suffix indicates the relationship of the patient to the beneficiary. For example, the Medicare number of a wife covered under her husband's account is his Social Security number followed by a "B".

The lack of matching MADRS records for Medicare numbers on the Georgetown data set is probably due to two factors. One of these is transcription and punching errors in Medicare numbers in the Georgetown data set. It is our understanding that the Medicare numbers on the Georgetown data set were not verified after they were data entered. The other factor involves outdated Medicare numbers. Patients sometimes inadvertently provide outdated Medicare numbers to home health agencies. Medicare numbers submitted on claims are automatically updated by the fiscal intermediary before the claim is paid and a record is generated for MADRS. Agencies themselves, however, have no means of determining the correct Medicare number. Thus, outdated numbers could appear on the completed abstraction forms provided to Georgetown University.

b. Inconsistencies in the Number of Home Health Visits

There were frequently inconsistencies between the MADRS data and the Georgetown data with respect to the number of visits in an episode. On the basis of a manual examination of 100 cases, we estimated that the counts of the number of visits differed in 52 percent of cases. Fortunately, these inconsistencies were generally small; the two counts differed by one or two visits in 69 percent of the cases with inconsistencies. Neither the MADRS nor the Georgetown count was systematically larger; each is larger in about half of the cases. However, the likelihood of inconsistency increased with the number of visits involved. In our manual sample, the total number of visits for inconsistent cases averaged 23.4, as compared to 14.0 for consistent cases.

Some of the inconsistencies between the number of visits on Georgetown and MADRS were a result of differences between our standardized definition of an episode and the admission practices of agencies. However, there are an number of cases in which the beginning and ending dates of the periods covered coincide perfectly in the Georgetown and MADRS data sets, but the number of visits differs.

The fact that neither the Georgetown nor MADRS count is systematically larger suggests that the remaining inconsistencies arise from a number of factors. We identified three possible problems

with the MADRS data that may give rise to these inconsistencies. First, during the period in which our MADRS abstract was prepared a large number of home health claims had been inadvertently omitted from the MADRS records. We estimate that this problem may have affected about one hundred of the cases in the Georgetown data set. (The omission of these claims from MADRS was later identified and corrected.) Second, a small percentage of the MADRS records seemed to involve duplicate claims--about 2 percent based on manual review of a sample of 100 claims. Third, agencies do not bill all the visits they provide; we estimate that ten percent of visits may go unbilled. Such visits may sometimes appear in the agencies records as Medicare visits. We also identified three possible problems with the Georgetown data. First, some of the inconsistencies may arise from abstracting or recording error on the part of home health agency staff completing the abstraction forms and from punching error. Second, staff of participating home health agencies may not have had access to data on visits rendered by subcontracted home health providers. Third, staff of participating agencies probably had no ready way to identify visits billed but denied and not paid under waiver. Such visits do not appear on MADRS.

As there was no way to resolve the inconsistencies between the Georgetown and MADRS data on a case-by-case basis, we used the counts of the number of cases from the Georgetown data. Both data sets appeared to offer reasonable counts, albeit somewhat different in individual cases. Overall, the Georgetown data set was far superior for our purposes. It contained key data elements, including the number of visits by type and the dates of visits, not available from MADRS. We ruled out the alternative of adjusting the Georgetown data so that the number of visits summed to the total number of visits in MADRS. That procedure would have required the application of arbitrary rules to a large portion of the sample, and the application of these rules would itself introduce error.

B. PARTIAL EPISODES

As indicated in Chapter I, we defined an episode of Medicare home health care (for the main body of our analysis) as a series of Medicare home health visits preceded and followed by 30 day periods in which there are no bills for Medicare home health care. We used the MADRS data to identify cases with Medicare home health care bills within 30 days preceding the date of the first visit or within 30 days following the date of the last visit on the Georgetown data.

There were over 750 cases for which the episodes as identified by agencies on the Georgetown data set constituted partial episodes under our standardized definition of an episode. That is, the MADRS records indicated that the patient had a bill for Medicare home health in the 30 days preceding his or her first visit date on the Georgetown data file or within 30 days following his or her last visit date.

We excluded the cases with partial episodes. We did so because the relationship between patient characteristics and home health resource use during **part** of an episode may not be representative of the relationship between patient characteristics and home health resource use during an entire episode.

C. IMPLEMENTING THE EXCLUSION OF CASES

As described above, there were a number of circumstances in which we excluded cases from our database. The algorithms reflecting these circumstances were implemented serially, and counts were maintained of the number of cases excluded at each step of this process. Table V.1 indicates the order in which the various circumstances were considered and the number of cases that were excluded at each step.

TABLE V.1

CIRCUMSTANCE AND NUMBER OF CASES EXCLUDED
BY ORDER OF IMPLEMENTATION

Circumstance	Number of Cases Excluded
Not a Medicare patient according to Georgetown data set	151
Medicare number missing from Georgetown data set	29
No MADRS home health claims	138
Number of visits not billed to Medicare missing	381
Number of visits not billed to Medicare greater than number of visits on Georgetown data set	24
First visit date on Georgetown more than 30 days before or after Georgetown admission date	100
Number of visits not billed to Medicare greater than 5	112
Successive visit dates on Georgetown data set more than 60 days apart	32
No visit dates on Georgetown data set	94
No MADRS record or no matching MADRS record	956
No MADRS home health claim within 30 days following Georgetown first visit date	84
Georgetown episode is partial MADRS episode	756

VI. CREATION AND SELECTION OF EXPLANATORY VARIABLES

The Georgetown data set, supplemented by data from the MADRS data set, could be used to create a great many explanatory variables; far too many to include in our empirical analyses. Thus, we had to create and select an encompassing, yet limited set of explanatory variables for this empirical work.

Our basic approach to this task was to categorize the determinants of home health resource use into general substantive domains, such as medical condition and functioning. For each domain, we regressed standardized cost for home health care for episodes up to 120 days on various sets of explanatory variables, controlling for other variables that we had already identified for inclusion in empirical analyses. These regressions used ordinary least squares (OLS). Variables that we had strong a priori reason to believe were determinants of home health use were retained for further analysis despite the results of these regressions. We selected those for which we did not have strong expectations based on the statistical significance and magnitude of their individual coefficients. In cases in which we had more than one variable measuring a concept, we compared the relative explanatory power of the variables and selected the most powerful (provided it met our general criteria on statistical significance and magnitude). In cases in which the regression results did not indicate a clear choice, we selected the variable that would be more readily available in an on-going program of prospective payment.

By including variables that we believe are likely to be strong determinants of home health resource use regardless of the regression results for them, we help to ensure that we do not eliminate variables that may be useful in predicting costs using analytic techniques other than OLS. If we relied only on the regression results, we would run the risk of excluding variables that help to distinguish "average" cost patients, retaining only those variables distinguishing high and low cost patients.

The variables that were developed through the analysis described in this chapter were made available to all the analysts working on this project. However, they were also provided with the original Georgetown and MADRS data for the cases in our database and were free to construct additional variables.

The substantive domains into which we categorized the determinants of home health care use are:

- Medical condition
  - Care groups (based on diagnoses and procedures giving rise to home health care)
  - Comorbidities
  - Severity of illness
- Functioning
  - Activities of daily living (at admission to home health care)
  - Sensory, cognitive, and other limitations
  - Equipment and supply use
- Nature of care
  - Treatments planned or received (using coding system on HCFA form 486)
  - Nursing interventions planned or received (using coding system developed at Georgetown University)
- Prognosis at admission
- Truncation of episode (e.g., nursing home admission or death during the home health episode)
- Response to care
  - Change in functional status
  - Resolution of nursing problems
- Informal caregiving
- Demographic characteristics.

In the following sections, we discuss the variables in each of these categories. We describe how the variables in each category were defined, which variables were retained, and how missing data was treated.

A. MEDICAL CONDITION

As indicated above, there are three types of prospective variables about medical condition: care groups, comorbidities, and severity of illness.

1. Care Groups

HCFA form 485 includes an item for the ICD-9-CM code of the primary diagnosis, that is, the diagnosis giving rise to the need for home health care. It also includes an item for the ICD-9-CM code of the procedure giving rise to the need for home health care. The Georgetown instrument collects both of these codes.

The number of individual diagnosis and procedures codes in the Georgetown data set is very large, and the number of patients with a particular diagnosis or procedure code is often quite small. Therefore, it is necessary to group these codes. A common way to group them is by body system (e.g., cardiovascular conditions, musculoskeletal conditions). However, we rejected the body system approach because it combines conditions requiring extensive home health care with conditions requiring little home health care, so long as they pertain to the same body system.

For this analysis, we worked with our nurse consultant, (who has extensive experience in home health care) to group the diagnosis and procedure codes appearing in the Georgetown data set in terms of the type and amount of home health care to which they typically give rise. We called the resulting groups, "care groups." There are 44 care groups, and they are listed in Table VI.1. Since the 485 for a given patient may list both a primary diagnosis and a procedure giving rise to the need for home health care, it is possible for two care groups to apply to a given patient.

Because we judged the care groups to be strong potential determinants of home health care use, all of the care group variables were included in the database for further analysis, regardless of the statistical significance and magnitude of their individual coefficients. Indeed, the care groups appear to have greater explanatory power than groups of diagnoses and procedures based on body system. While there are differences in the dependent variable and sample, the care groups explain con-

TABLE VI.1

CARE GROUPS

Administration of Antibiotics
Aerosol Therapy
Care following Amputation
Care of Acute, Serious Respiratory Diseases
Care of Serious Cardiopulmonary Conditions
Care of Less Serious Cardiopulmonary Conditions
Care of Serious Cancers
Care associated with Benign Tumors and Limited Cancers
Care of Infectious, Contagious, and Parasitic Diseases
Care following Knee Surgery
Care following Hip Surgery
Care following Fracture or Paralysis of an Upper Limb
Care following Fracture or Paralysis of a Lower Limb
Care of the Cognitively Impaired
Care of Urinary Incontinence
Care of a Urinary Catheter and other Urinary Procedures
Care of Kidney Disease
Care of Bowel Incontinence
Care of Back Disorders
Care of Malnutrition, Dehydration and Electrolyte Imbalance
Care of Anemia
Care of Peripheral Vascular Disease
Care of Gastrointestinal Disorders
Care of Disorders of the Lymph and Blood Forming Tissues
Care following a Stroke
Care of Hypertension and Cerebrovascular Disease
Care of Acute Vascular Lesions and Aneurysms
Care of a Complicated Wound
Care of an Uncomplicated Wound
Care of Serious Neuromuscular and Degenerative Diseases
Care of Less Serious Neuromuscular and Degenerative Diseases
Care of Miscellaneous Symptoms and Injuries
Diabetic Care
Eye and Ear Care
Gastrostomy Care and Enteral Feeding
Medication Supervision
Monitoring following Head Injury or Head Surgery
Monitoring following Heart Surgery
Monitoring following Surgery on Blood Vessels
Monitoring following Other Serious Surgery
Monitoring following Lesser Procedures
Ostomy Care
Psychiatric Monitoring
Tracheostomy Care

siderably more variation in home health resource use than the body system groups used by Georgetown University staff in their analysis.

For a relatively small number of patients missing both the primary diagnosis and procedure codes, all of the care group variables were missing. The procedures for handling missing values varied by analytic technique. For the regression analyses, we created binary variables indicating whether or not care group information was missing and set the care group variables to zero when it was missing.

2. Comorbidities

One factor expected to increase home health utilization is the presence of a comorbidity that will prolong the recovery period, regardless of the primary problem which gave rise to the need for home health care. We worked with our nurse consultant and our clinical advisory panel to develop variables measuring comorbidities that could be identified with the four secondary diagnosis codes taken from 485s and appearing on the Georgetown data set.[1] The resulting list of comorbidities is presented in Table VI.2.

Because the clinical panel judged that these comorbidities were important determinants of home health use, we retained all of them (with two exceptions). The exceptions were obesity and immune system disease which were dropped because we determined that there were no patients on our Georgetown analysis file with these comorbidities.

In addition to the comorbidities listed in Table VI.2, we developed a condition-specific comorbidity for patients in a wound care group who also have a primary or secondary diagnosis associated with the slow healing of a wound, specifically diabetes, malnutrition, peripheral vascular disease, and urinary incontinence.[2] The first three of these diagnoses are associated with slow

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[1]The Georgetown instruments instructs the staff of participating agencies to consult all 485s in the patient's record.

[2]Recall that the care group may be set by the procedure code as well as the primary diagnosis code.

TABLE VI.2

COMORBIDITIES

Amputation of a Limb
Cancer
Congestive Heart Failure
Chronic Obstructive Pulmonary Disease
Dementia
Depression
Diabetes
End Stage Renal Disease and Chronic Renal Failure
Immune System Diseases
Malnutrition, Dehydration and Electrolyte Imbalance
Obesity
Neurological Diseases
Paralysis
Peripheral Vascular Disease

healing of a wound on any part of the body. Urinary incontinence is associated with slow healing of wounds on the lower portion of the trunk or upper legs.

Because of the limitation to information on the Georgetown data set, Table VI.2 does not include two comorbidities identified by the clinicians. These are alcoholism and severe arthritis. Alcoholism is rarely coded even when present because of the social stigma associated with it. Only severe arthritis has a major effect on the use of home health resources, and severity is not taken into account in the diagnosis codes.

3. Severity of Illness

Health care practitioners "know" that more severely ill patients use more health care resources, but measuring of severity of illness is difficult. We proposed to use two types of measures of severity of illness: (1) the score produced by the Disease Staging algorithm using ICD-9-CM codes from the hospital stay prior to the home health episode; and (2) proxy measures based on health services use. Because of budget limitations, we deferred using the Disease Staging algorithm. (As discussed in Chapter IV, based on our results to date, we do not now believe that the expense entailed in using Disease Staging is warranted.)

The health services use measures that we considered as proxy measures for severity of illness are:

- Number of home health visits in the six months prior to the start of the home health episode
- Number of hospital admissions in the six months prior to the start of the home health episode
- Total Medicare Part A expenditures in the six months prior to the start of the home health episode
- A binary variable indicating whether the beneficiary was discharged from the hospital within 14 days of the start of the home health episode
- A binary variable indicating whether the beneficiary was discharged from a skilled nursing facility within 14 days of the start of the home health episode
- The number of admissions to the hospital during the home health episode

- The number of days spent in the hospital during the home health episode.

The last two of these measures relate to health services use during the home health episode. Not only may a patient be more or less severely ill at admission to home health care, but he or she may suffer an exacerbation of his or her illness or may suffer from an additional, unrelated illness or injury. Obviously, both an exacerbation of an existing illness and an additional illness are likely to increase the home health resources required by a patient.

All of the variables discussed in this section were constructed from data on HCFAs MADRS file. For the purposes of constructing these variables, we assumed that the bill records contained on MADRS are complete. Thus, there are no missing data elements--if no bill exists, it is assumed that the person did not receive the services.

To determine which of these variables should be included in further analysis, we estimated five regressions involving combinations of them and including the care groups, comorbidities, treatment, and demographic variables as control variables. (The latter two types of variables are discussed below.) In the first regression, we included the variables which proxy severity of illness immediately prior to home health admission--hospital discharge and skilled nursing facility discharge. In the second regression, we added a measure of utilization in the previous six months--total Medicare expenditures in that period. In the third regression, we dropped total Medicare expenditures and used the number of hospital admissions in the previous six months and the number of home health visits in the previous six months. Finally, in the last two regressions, we added the number of hospital admissions during the home health episode and the number of hospital days during the home health episode. Summary statistics from these regressions are listed in Table VI.3.

The key findings are:

- The two measures of utilization immediately prior to home health admission were consistently positive and generally statistically significant. The coefficient for hospital discharge indicated that a post-hospital care patient had $44.20 higher costs on average, than a patient admitted from the community. The coefficient for skilled nursing facility

TABLE VI.3

KEY STATISTICS FROM THE EXPLORATORY REGRESSIONS

Severity of Illness

R^2	.18	.18	.18	.20	.20
ADJ-R^2	.16	.16	.17	.19	.18
Immediately before Home Health Admission					
Discharge from hospital	44.20 (.08)	22.13 (.39)	57.59 (.03)	51.84 (.0584)	51.82 (.0592)
Discharge from skilled nursing facility	228.40 (.0001)	188.52 (.0006)	231.58 (.0001)	238.90 (.0001)	237.65 (.0001)
Previous six months					
Total Medicare expenditures		.005[a] (.0008)			
Hospital admissions			2.73 (.8084)	-5.73 (.6083)	-2.76 (.8052)
Home health visits			6.73[b] (.001)	6.08 (.0001)	6.70 (.0001)
During Home Health Episode					
Hospital admissions				216.39 (.0001)	
Hospital days					20.61[c] (.0001)

NOTE: Significance levels in parentheses.

[a]The average value of total Medicare expenditures in the previous six months is $6,846. Thus, this coefficient is equal to a $34 increase for the average beneficiary.

[b]The average number of hospital admissions in the previous six months is 3.8 visits. Thus, this coefficient is equal to a $25 increase for the average beneficiary.

[c]The average value of hospital days during the home health episode is 1.34 days. Thus, this coefficient is equal to a $27 increase for the average beneficiary.

discharge indicated that a patient discharged from such a facility had $228.40 higher costs on average, than a patient admitted from the community.

- Two of the three measures that measured utilization in the 6 months prior to the start of the episode (total Medicare expenditures and number of home health visits) had positive and statistically significant coefficients at the .1 level. The coefficient on the total Medicare expenditures variable indicated that an extra $10,000 in Medicare expenditure results in an extra $50.00 of home health charges. The coefficient on the number of home health visits indicated that an extra home health visit increases the episode cost by $6.73. The number of hospital admissions in the previous six months had a small coefficient (an extra hospital admission increased costs by $2.73) and was statistically insignificant.

- When we added total Medicare expenditures, the coefficient on hospital discharge decreased by 50 percent and became statistically insignificant. When hospital admissions and home health visits in prior six months were added, the coefficient on hospital discharge status increased by 30 percent and remained statistically significant. This result suggests hospital discharge status is correlated with total Medicare expenditures and that the information contained in these proxy measures may overlap.

- Hospital days and hospital admissions during the home health episode were significantly correlated with home health costs; yet the addition of these variables did not significantly change the coefficients on the variables measuring service use prior to admission to home health care.

As a result of these regression results, we dropped some variables and retained others. We dropped the variable on the number of hospital admissions in the previous six months; the estimated coefficients for it were small and statistically insignificant. We dropped the variable on [illegible] Medicare expenditures and selected the number of home health visits in the previous six month[illegible]ad. Total Medicare expenditures was highly correlated with the hospital and nursing home discharge variables. An additional argument for excluding total Medicare expenditures is that it will be difficult to collect in an on-going program of prospective payment. Finally, we dropped the number of hospital days during the home health episode and selected the number of hospital admissions during the home health episode instead. While the two variables have comparable explanatory power, it will be easier to track hospital admissions than hospital lengths of stay in an on-going program.

B. FUNCTIONING

In this section, we explore three different types of variables to capture functional limitations. These are: Activities of Daily Living (ADLs); sensory, cognitive, and other limitations; and the use of equipment and supplies. Our approach was to start with models including the basic measures of limitation in physical functioning, the ADLs. To determine if additional variation in home health use could be explained using additional variables related to functioning, we then augmented these models with variables measuring sensory, cognitive, and other limitations and the use of equipment and supplies.

1. Activities of Daily Living

In general, one expects that the more limited patient physical functioning, the greater the care needs and the greater the use of home health resources. However, this is not always the case: extremely functionally limited patients may require less care. For example, it may take fewer resources to change diapers for a patient who is incontinent than to assist a very frail individual in getting to and using the toilet. The likelihood of non-linear relationships between functional impairment and the use of home health resources suggests that care is required in specifying measures of ADL.

The Georgetown data set has measures of nine ADL tasks at admission. These measure impairment in bathing, continence, dressing, feeding, medication administration, toileting, transferring, telephone use, and walking. Two of these measures--medication administration and telephone use--are not typically considered ADL measures, but we have grouped them here for convenience. For each of these ADL tasks, a patient was coded as: "independent," "assistance of person/device," and "dependent (unable to perform activity)." From this data, we constructed the following measures of ADL at admission:

- A single binary variable for each ADL, set to 1 if the patient has any limitation in the task, that is, he or she either needs assistance or is dependent.

- A set of two different binary variables for each ADL, with the first binary variable set to 1 if the patient needs assistance. The second binary was set to 1 if the beneficiary was dependent in that ADL.

- The sum of the nine individual ADL binaries for any limitation. This variable can range from 0 to 9.

- The sum of the seven individual ADL binaries for the traditional ADL tasks (bathing, continence, dressing, feeding, toileting, transferring, and walking). This variable can range from 0 to 7.

- A binary variable set to 1 if the patient has limitations in any ADLs that should be met on demand. That is, limitation in continence, toileting, transferring, and walking.

- A binary variable set to 1 if the patient has any limitations in ADLs which can be scheduled on a daily basis. That is, limitation in dressing, feeding, and medications.

To determine which of these measures was the best measure for explaining home health use, we estimated five regressions with each of the five different functioning measures, and including care groups, comorbidities, treatments, and demographic variables as control variables. Summary statistics from each of these regressions are presented in Table VI.4. The key findings from these regressions are:

- Any limitation in bathing, dressing, or transferring adds about $100 to the cost of the episode if the variable is a binary indicating whether or not the patient needs any assistance. The impact is twice as large or more if the extent of limitation is taken into account.

- The coefficients for any limitation in continence, toileting, telephoning and walking are relatively small and statistically insignificant. Part of this may be attributed to correlation with the care groups (which also measure continence) and to correlation between toileting and walking.

- The models which include variables for individual ADL tasks have slightly more explanatory power than those with summary ADL information.

Due to the slightly higher explanatory power we decided to use the variables for individual ADL tasks in further analysis. We opted to use the binary variables indicating any limitation for two reasons. First, we found large, counter-intuitive results using the pair of binary ADL variables which separate dependence and assistance. These results indicated that home health costs are $118 lower,

TABLE VI.4

KEY STATISTICS FROM THE TEST REGRESSIONS

ADL Measures

R^2	.19	.19	.18	.18	.18
$ADJ\text{-}R^2$	.17	.18	.17	.17	.16
Individual ADL Tasks					
Bathing					
Any limitation	110.50 *				
Some assistance		107.57 *			
Total dependence		294.14 *			
Continence					
Any limitation	8.05				
Some assistance		9.50			
Total dependence		-27.48			
Dressing					
Any limitation	112.17 *				
Some assistance		110.49 *			
Total dependence		56.00			
Feeding					
Any limitation	-68.99 *				
Some assistance		-80.19 *			
Total dependence		-195.99 *			
Medication					
Any limitation	-46.61 *				
Some assistance		-57.38 *			
Total dependence		-11.31 *			
Toileting					
Any limitation	2.24				
Some assistance		-14.63			
Total dependence		11.18			
Transferring					
Any limitation	109.70 *				
Some assistance		99.70 *			
Total dependence		244.54 *			
Telephoning					
Any limitation	-20.11				
Some assistance		-13.68			
Total dependence		-117.61 *			
Walking					
Any limitation	-.63				
Some assistance		.71			
Total dependence		-57.29			

TABLE VI.4 (continued)

R^2	.19	.19	.18	.18	.18
ADJ-R^2	.17	.18	.17	.17	.16
Summary ADL Measures					
All ADLs			30.69 *		
Selected ADLs				42.70 *	
Demand ADLs					96.46 *
Scheduled ADLs					128.54 *

* Significant at the .10 level.

on average, for patients who are dependent in telephoning and $196 lower, on average, for patients who are dependent in feeding (compared to patient who are independent in these tasks). Second, the instructions in the Georgetown instrument for the nurses coding the ADLs were ambiguous. Because patients who are dependent need the assistance of another person, some nurses may have checked the incorrect level of limitation in such cases. If so, the binary variables indicating any limitation may be less subject to measurement error than the pair of binaries for dependence and assistance.

We dropped three of the individual ADL measures from further analysis. We dropped walking because it requires many of the same functional skills as toileting and was statistically insignificant at the .1 level. We dropped continence because this variable is already measured in a care group and as a comorbidity, and was statistically insignificant at the .1 level. Finally, we dropped telephoning; the estimated coefficient was small and statistically insignificant at the .1 level.

ADL measures could be coded as missing on the Georgetown instrument. For the regressions, we replaced missing values with the average value for that ADL category, and included a binary variable in our regressions that was coded as 1 if any of the ADL variables at admission were missing.

2. Sensory, Cognitive, and Other Limitations

In addition to those in ADL, other limitations may affect the use of home health care. The Georgetown data set included seven items in checkbox format indicating whether the patient was limited in speech, hearing, sight (legally blind), mental capacity, or ambulation or was limited by an amputation or paralysis.

To determine if these variables affected home health use, we regressed the standardized cost of home health care on them, controlling for care groups, comorbidities, treatments, demographic characteristics and the ADL variables. We found that all of the variables were statistically significant at the .1 level, with the exception of paralysis and amputation.

One reason for this lack of significance for paralysis and amputation may be that both of these limitations are also measured as comorbidities (which are based on the secondary diagnosis codes). However, a number of patients that had paralysis or amputation checked as a limitation did not have it coded as a secondary diagnosis. An explanation for the discrepancy may be that the boxes are checked for "old" conditions but the secondary diagnoses are not provided, particularly as it is easier to check a box than code a diagnosis.

Since the clinical panel had strong a priori views about the impact of sensory, cognitive, and other limitation on home health use, we retained all of these variables including amputation and paralysis.

As a result of the checkbox format in which the information was collected in check boxes, there are no missing values for these limitation variables.

c. Equipment and Supply Use

The relationship between the use of equipment and supplies and the use of home health care may depend upon the particular type of equipment or supplies involved. The utilization of certain types of equipment and supplies may indicate functional limitations that require increased home health care; however, other types of equipment may serve as a substitute for human assistance, decreasing the need for home health care. This potential for differential impacts led us to construct separate variables for various types of equipment and supplies.

The Georgetown instrument uses checkboxes to collect information on the use of the following types of supplies and equipment: ostomy supplies, feeding supplies, chux pads (adult diapers), enema supplies, toileting equipment, bed appliances, rehabilitation equipment, respiratory equipment, feeding equipment, cane, crutches, wheelchair, and walker. We constructed a binary variable for each of these types of equipment and supplies.

To determine whether their use affects the use of home health care, we first regressed home health utilization on the equipment variables related to ambulation: use of a cane or crutch,

wheelchair, and walker. In this regression, we controlled for care groups, comorbidities, treatments, severity of illness, ADLs, and nursing interventions. (The nursing intervention variables are discussed below.) The results indicate that even after controlling for the ADLs and other variables, there is a strong, positive relationship between wheelchair use and cane or crutch use and home health use. The use of a walker, however, had a small coefficient and was not statistically significant at the .1 level. As a result, we dropped the use of a walker from further analysis.

Next, we regressed the remaining (non-ambulatory) equipment and supply variables on home health use. This model included the same control variables. The results from this regression indicated that the use of chux pads and enema supplies increased the use of home health care; the coefficients were statistically significant at the .1 level. The regression also showed two counter-intuitive results: the use of respiratory equipment and of feeding equipment had large, negative effects on home health use. However, only the coefficient on respiratory equipment was above our cut-off significance level of .1. We retained the variables on chux pads, enema supplies, and respiratory equipment.

As a result of the checkbox format with which information was collected, there were no missing values for the equipment and supply variables.

C. NATURE OF CARE

The Georgetown database contains two types of information on the nature of the care planned or received. One type was collected using the treatment codes included in HCFAs form 486. These treatment codes pertain to all of the six disciplines covered under Medicare home health care (skilled nursing, physical therapy, occupational therapy, speech therapy, medical social work, and home health aide). The second type provides more detailed information on nursing services planned or received.

1. Treatments Planned or Received

The Georgetown instrument instructs the staff of home health agencies participating in the study to review all forms in the clinical record and code the nature of the care provided during the home health episode, using the plan of treatment codes on the 486 (relevant codes were to be circled on a copy of the 486). Although the instructions indicate that care **provided** is to be coded, the fact that all forms are to be consulted (including 486s) and that the plan of treatment codes are to be used probably led home health agency staff to code care that was planned but never received. Indeed, when we collapse the treatment codes by the six disciplines that provide them and compare the resulting categories to information on the six types of Medicare visits received, we find that some patients who are coded as receiving a treatment are not coded as having received the associated type of visit. For example, about six percent of those with a home health aide treatment did not receive home health aide visits. Because of the ambiguity in the instructions and differences in the data, we believe that both planned and received treatments are reflected in the treatment variables.

We developed three types of variables using the treatment data. All are binary variables. First, we developed a binary variable for each of the six disciplines indicating whether **any** treatment associated with that discipline was planned or received. For example, we developed a variable indicating whether any speech therapy was planned or received. Second, we developed variables for each of 73 treatments--29 skilled nursing, 10 physical therapy, 10 occupational therapy, 8 speech therapy, 5 medical social service, and 11 home health aide treatments. Third, we developed variables for nursing, physical therapy, speech therapy, and occupational therapy indicating whether the patient had a treatment of evaluation, but no other treatment by that discipline.

We estimated a number of regression models including combinations of the first two types of binary variables--the six discipline variables and the individual treatment binary variables. One model included only the six discipline variables; another model included all of the individual treatment variables; and still a third model included both of these sets of variables. A comparison of the F

statistics for these models indicated that the individual treatment variables explained more of the variation in home health cost. We examined the coefficients and statistical significance of the variables included in the second model. All of the individual treatment variables in that model with a significance level of .1 or higher were retained for further exploratory analysis.

For each discipline, we then estimated models containing the individual treatment variables significant in the first step, the binaries indicating that the patient had evaluation for care by that discipline only, and the binary for that discipline. We examined the coefficients from these models and retained all variables with a significance level of .1 or higher for further analysis. These variables are listed in Table VI.5.

There were some cases with no data on treatments. All the treatment variables for these cases were missing. For the regressions, we set the missing values to zero and created binary variables to identify these cases in further analysis.

2. Nursing Interventions

The Georgetown instrument instructs the staff of the agencies participating in the study to describe, in narrative form, all of the skilled nursing services received by the sampled patient that have not already been listed using the treatment codes. The Georgetown University staff developed a coding system for nursing interventions based on the information in the narratives and the treatment codes. These nursing interventions are grouped into 166 categories, and 56 major categories. In general, we used these 56 major categories in our analysis. However, in a few cases we retained the original, less aggregate categories because we judged that the major category included patients with very different care needs.

To explore the explanatory power of these variables, we regressed cost on all of nursing intervention variables, controlling for care groups and treatments. Nine of the nursing intervention variables were statistically significant at the .1 level or higher. They are:

TABLE VI.5

TREATMENT VARIABLES RETAINED FOR FURTHER ANALYSIS

Nursing

Administration of Vitamin B12
Administration of injections
(other than B12 and insulin)
Bladder instillation
Bowel/bladder training
Decubitus care, stage 1 or 2
Decubitus, stage 3 or greater
Foley insertion
Open wound care/dressing
Restorative nursing
Teach gastrosomy feedings
Teach care of tracheostomy
Teach diabetic care
Venipuncture

Physical Therapy

Any physical therapy
Prosthetic training
Therapeutic exercises
Transfer training

Speech Therapy

Any speech therapy
Evaluation only
Speech articulation disorder

Occupational Therapy

Any occupational therapy
Muscle re-education

Social Work

Any social work
Short term therapy

Home Health Aide

Any aide
Bedbath
Catheter care
Assist with ambulatio7n
Assist with exercises

- Activity care
- Bowel care, other than bowel training
- Cardiopulmonary conditioning
- Conditioning of other body systems
- Infusion care
- Mobility therapy
- Psychosocial analysis
- Respiratory care
- Vital signs.

The nursing intervention variables listed above were retained for further analysis.

There were some patients who appeared on the Georgetown data set as having none of the nursing interventions. (One "nursing" intervention indicated whether another discipline provided care to the patient.) Their nursing intervention variables were missing. For the regression analysis, we set the nursing intervention variables to zero in these cases and created binary variables to identify these patients in future analyses.

D. PROGNOSIS

The effect of a patient's prognosis on home health use is ambiguous. For example, it seems possible a priori that a patient with a fair prognosis for recovery may receive more care than a patient with a good prognosis (who may recover more readily) and more care than a patient with a poor or guarded prognosis (for whom extensive treatment may be ineffectual and appropriately withheld).

The only prognosis measure available on the Georgetown data set is an overall assessment of prognosis at admission as excellent, good, fair, or poor/guarded.

To determine whether a variable measuring overall prognosis explains home health use, we regressed home health costs on a series of binary variables representing the various prognoses and control variables, including care groups, comorbidities, functional limitations, treatments, severity of illness, and demographic characteristics. The regression results indicated that none of the prognosis coefficients were statistically significant at the .1 level, and we excluded them from further analysis.

E. TRUNCATION

Home health care may be terminated for a number of reasons other than the patient's full recovery. In these cases, one expects that the patient will, on average, receive fewer home health visits than a comparable patient whose care is not so terminated.

To account for cases where the episode of care may be truncated, we created a variable which was set equal to 1 if the episode lasted less than 120 days and one of the following occurred:

- The patient died
- The patient entered a skilled nursing facility
- The patient moved from the area
- The patient refused treatment

We regressed home health cost on this truncation variable, controlling for care groups, comorbidities, treatments, functional limitations, severity of illness, response to care, and demographic characteristics. (The response to care variables are discussed below.) The coefficient on the truncation variable was negative and very highly statistically significant. Thus, we retained it for further analysis. By construction, the truncation variable was never missing.

F. RESPONSE TO CARE

We have two ways of measuring response to care with the Georgetown data: change in functioning and resolution of problems.

1. Change in Functional Status

Because assisting patients who are able to improve their functioning may require a substantial amount of home health resources, our expectation was that change in functional status would be positively associated with the cost of home health care.[3]

To measure the change in functional status, we developed the following measures:

- A variable measuring change in each ADL task which is set to -1 if the patient became more impaired during the home health episode; set to 0 if his or her status did not change; and set to 1 if he or she became less impaired.
- A variable summing all the individual ADL task change variables defined above. This variable could range from -7 to 7.
- A binary variable measuring deterioration during the home health episode across all ADL tasks. This variable is set to 1 if the number of ADL tasks on which the patient is impaired at the beginning of the episode is less than the number on which he or she is impaired at the end of the episode.
- A binary variable measuring improvement during the home health episode across all ADL tasks. This variable is set to 1 if the number of ADL tasks on which the patient is independent at the beginning of the episode is less than the number on which he or she is independent at the end of the episode.

A key difference between variable summing the individual ADL task change variables and the binary variables measuring deterioration and improvement across all ADL tasks is that the former constrains deterioration and improvement in functioning to have a constant impact on home health use, while the latter allows for differential impacts for deterioration and improvement (relative to stability).

We estimated three models. In the first model, we regressed all of the individual ADL task change variables on cost; in the second model, we regressed the sum of the individual change variables on cost; and in the third model, we regressed the deterioration and improvement variables on cost. In each of these models we included care groups, comorbidities, severity of illness,

[3]It could be that patients with an improved functioning level are those that received more care, making change in functional status an endogenous variable. We opted to ignore this issue for our exploratory analysis and have not pursued it further with the Georgetown data. Because there are only very limited measures of change in functioning available in the main body of the demonstration data, such an investigation is probably not warranted with that data.

treatments, demographic characteristics, and ADL at admission as control variables. Summary statistics for these regressions are presented in Table VI.6.

The key findings are:

- The model including the binary variables for deterioration and improvement had a somewhat higher R^2 than either of the other two models.
- The coefficients of the binary variables for deterioration and improvement have a much higher level of statistical significance than the alternative variables measuring change in functioning.
- The coefficients on the binary variables for deterioration and improvement are both positive, suggesting that patients who are improving and patients who are deteriorating have higher costs than those who remain functionally stable over the course of the home health episode.

We retained the binary variables measuring deterioration and improvement in functioning for further analysis and dropped the other variables measuring change in ADL.

The variables measuring deterioration and improvement in functioning can be missing because an ADL measure at admission is missing or because an ADL measure at discharge is missing. As indicated above, a binary variable was included in the regressions for any patient missing an ADL measure at admission. To account for missing values in change in functioning in the regressions, we included a binary variable indicating when any ADL variable was missing at discharge. In addition, the binary variables measuring deterioration and improvement in functioning were set to zero in such cases.

2. Problem Resolution

Our expectation was that assisting patients to improve their health status would require more care than maintenance of their health status.

TABLE VI.6

CHANGES IN ADL FUNCTIONING
KEY STATISTICS FROM THE TEST REGRESSIONS

R^2	.20	.20	.21
ADJ-R^2	.19	.18	.19
Change in Individual ADL Tasks			
Walking		-75 (.02)	
Bathing		-23 (.060)	
Dressing		106 (.03)	
Feeding		83 (.09)	
Transferring		36 (.42)	
Toileting		9 (.85)	
Medications		23 (.65)	
Summary Change Measures			
Change	.15 (.01)		
Deterioration			352 (.0001)
Improvement			147 (.0001)

NOTE: Significance levels in parentheses.

The Georgetown data set contained one measure of improvement in health status. The status at discharge for each patient problem or nursing diagnoses[4] reported in the instrument was recorded, using four statuses: improved, did not change, stabilized, or deteriorated. We summed the number of problems that fell into each of these discharge status categories for each individual.

We regressed cost on these sums, while controlling for care groups, comorbidities, functional limitations, severity of illness, treatments, prognosis, change in functional status, and demographic characteristics. We found that the coefficients on all of the problem resolution variables were statistically significant at the .1 level, with the exception of deterioration. We opted to retain all of the problem resolution variables for further analysis, including deteriorated. For the regression analysis, missing values were filled with the average value for the variable.

G. INFORMAL CAREGIVING

Our strong a priori expectation is that the availability and ability of informal caregivers affects the use of home health care. However, the Georgetown data set contains only very limited measures of informal caregiving. With the limited information available to us, we constructed four different variables measuring informal caregiving:

- A binary variable indicating whether or not the patient lived alone.
- A binary variable indicating whether or not the patient was available to be his or her own primary caregiver
- A binary variable indicating whether or not the patient lived with a relative or friend available to be a primary caregiver
- A binary variable indicating whether or not there was relative or friend (either visiting or live-in) available to be primary caregiver.

[4]Patient problems and nursing diagnoses were recorded in the instrument in narrative form and coded by Georgetown University staff in 147 categories.

We regressed home health cost on each of these informal care variables, controlling for care groups, comorbidities, treatments, and ADLs. We found that none of the informal caregiving coefficients were statistically significant at the .1 level. However, because we have strong expectations that informal caregivers affect home health use, we retained the variable measuring whether or not the patient lived alone, the closest of the four informal caregiving measures to statistical significance.

In cases in which the variable measuring whether the patient lived alone was missing, we replaced the missing value with the average for this variable for the regression analysis.

H. DEMOGRAPHIC CHARACTERISTICS

The Georgetown data set contains measures of a few demographic characteristics. There are measures of Medicaid status, age, sex, and race. With the exception of Medicaid status (which is discussed further below), we do not expect these variables to directly affect home health use. However, these demographic variables may be correlated with unmeasured factors (such as frailty and health status) which may in turn affect home health use. Accordingly, we have retained all of these measures in our regressions. There are no missing values of any of the demographic variables.

The relationship between Medicaid status and home health use is ambiguous. Because low income is generally associated with poorer health status, Medicaid status may be positively correlated with the home health care use, such that patients who are participants in the Medicaid program may need and receive more Medicare home health care than other patients. However, Medicaid status may also have a direct effect on home health use. Given the high level of denials in the years immediately before the Georgetown data were collected, agencies may have been inclined to use Medicaid as a payment source when it was available rather than risking a denial of a Medicare home health claim. To the extent that this is the case, patients who are participants in the Medicaid program may receive less Medicare home health care than other patients.

VII. REGRESSION MODELS

In the following two sections we present the basic regression results, determine whether the estimates from the model are consistent with our knowledge of home health care, and assess whether limiting the set of explanatory variables significantly affects our ability to predict home health utilization. We then explore empirical refinements of the basic model. The key results from these analyses are:

- The linear regression model developed from the data base is basically consistent with expectations, although some anomalies and counter-intuitive results exist.
- Home health treatment codes are the key variables for explaining home health use. Excluding variables that measure response to care (e.g., change in functioning) and other data not available until the end of an episode does not seriously weaken the explanatory power of regression models. However, limiting the explanatory variables to only those that are known prior to establishing the care plan significantly decreases explanatory power.
- Different regression approaches that attempt to control for skewness in the data, differences in the types of care needed by patients (e.g., therapy, aide, nursing only), and truncation in the dependent variable (e.g., due to death of the patient) do not alter the basic results of the model, nor do they improve the predictive power of the model. The logarithmic functional form yields a substantially larger mean squared error. Using a Tobit regression approach, we found that we overpredicted actual costs on average.

A. INITIAL REGRESSION MODELS

1. Basic Results

Our first analytic approach was to regress home health cost on all of the variables selected by the process explained in Chapter VI. The key findings from this regression (see Column 3 of Table VII.1) are:

- The model explained 37 percent of the variance in costs. The adjusted R^2 was .355.
- Of the 127 estimated coefficients on binary variables (not including the variables included for missing data), 77 coefficients have an estimated absolute value of $59 or greater--the value of 1 skilled nursing visit. Fifty-two of the 77 coefficients were statistically

TABLE VII.1

PARAMETER ESTIMATES FOR REGRESSION MODELS USING HOME HEALTH CARE COSTS AS THE DEPENDENT VARIABLE
(T-statistics in parentheses)

Independent Variables	Patient Characteristics Only	Nature of Care	Basic Model	Reduced Model (Stepwise)	Reduced Interacted Model (Stepwise)	Log Cost	Tobit
Comorbidities							
Cancer	-13.3 (-0.29)	-17.6 (-0.42)	-5.2 (-0.13)			-0.032 (-0.81)	-8.5 (-0.21)
Congestive Heart Failure	43.8 (0.96)	69.7 (1.68)	61.5 (1.52)	66.0 (1.71)		0.057 (1.45)	64.2 (1.59)
Chronic Obstructive Pulmonary Disease	62.1 (1.43)	63.2 (1.62)	46.1 (1.21)		62.1 (1.80)	0.055 (1.48)	47.1 (1.24)
Dementia	-192.5 (-1.88)	-26.6 (-0.29)	-30.3 (-0.34)			-0.076 (-0.87)	-32.6 (-0.36)
Diabetes	69.9 (1.91)	-68.9 (-1.82)	-65.7 (-1.77)	-51.2 (-1.50)	-49.8 (-1.51)	-0.037 (-1.02)	-61.7 (-1.66)
Amputation	539.0 (2.28)	718.2 (3.37)	709.1 (3.41)	723.0 (3.53)	848.1 (4.31)	0.432 (2.15)	717.7 (3.46)
Neurological Disease	87.1 (1.31)	70.2 (1.18)	67.7 (1.16)			0.053 (0.94)	69.4 (1.19)
Peripheral Vascular Disease	163.5 (2.50)	133.5 (2.30)	142.4 (2.50)	134.6 (2.39)	123.2 (2.27)	0.091 (1.66)	146.8 (2.59)
End Stage Renal Disease	-5.5 (-0.04)	1.0 (0.01)	-4.8 (-0.04)			0.071 (0.56)	1.8 (0.01)
End Stage Renal Disease * Aide					416.8 (1.94)		
Malnutrition/Dehydration	-6.7 (-0.13)	-16.9 (-0.36)	-25.5 (-0.55)			-0.009 (-0.20)	-25.1 (-0.54)
Depression	107.1 (3.16)	30.8 (1.02)	5.0 (0.17)			0.008 (0.26)	4.1 (0.14)
Incontinence	246.6 (3.29)	140.0 (2.08)	139.1 (2.09)	128.9 (1.97)		0.135 (2.10)	142.1 (2.14)
Incontinence * (Aide and Therapy)					447.5 (3.39)		
Paralysis	94.9 (1.78)	22.6 (0.47)	15.2 (0.32)			-0.019 (-0.42)	11.4 (0.24)
Slow Wound Healer	224.4 (2.86)	156.7 (2.08)	154.0 (2.09)	166.7 (2.46)	161.6 (2.45)	0.095 (1.33)	152.1 (2.07)
Care Groups							
Eye and Ear Care	-145.1 (-1.43)	-148.7 (-1.65)	-140.1 (-1.59)	-122.4 (-1.45)		-0.226 (-2.64)	-153.3 (-1.73)
Knee Surgery	172.8 (1.67)	51.1 (0.56)	54.1 (0.59)			0.160 (1.81)	50.0 (0.55)
Hip Surgery	91.4 (1.30)	-29.4 (-0.46)	-36.0 (-0.56)			-0.061 (-1.01)	-43.5 (-0.69)
Ostomy Care	116.8 (1.26)	108.1 (1.33)	110.9 (1.39)		134.7 (1.83)	0.140 (1.82)	104.6 (1.31)
Amputation	297.9 (2.92)	179.1 (1.94)	180.2 (2.00)	185.4 (2.12)	233.9 (2.78)	0.110 (1.26)	162.8 (1.80)

TABLE VII.1 (continued)

Independent Variables	Patient Characteristics Only	Nature of Care	Basic Model	Reduced Model (Stepwise)	Reduced Interacted Model (Stepwise)	Log Cost	Tobit
Tracheostomy	23.0 (0.15)	39.7 (0.22)	-4.5 (-0.03)			-0.041 (-0.24)	1.3 (0.01)
Diabetic Care	3.0 (0.04)	-65.6 (-0.91)	-61.4 (-0.86)			0.051 (0.74)	-60.3 (-0.85)
Diabetic Care * (Aide and Therapy)					-595.8 (-2.94)		
Aerosol Therapy	-74.0 (-0.85)	84.6 (1.07)	88.8 (1.15)			0.081 (1.09)	84.0 (1.09)
Aerosol Therapy * Aide					259.1 (2.37)		
Cardiopulmonary: Less Serious	-16.6 (-0.21)	75.0 (1.08)	54.1 (0.80)			0.003 (0.05)	47.4 (0.70)
Monitoring Serious Surgery	39.6 (0.92)	23.2 (0.60)	5.3 (0.14)			-0.033 (-0.89)	3.5 (0.09)
Monitoring Serious Surgery * (Aide and Therapy)					-300.2 (-2.23)		
Monitoring Heart Surgery	-69.5 (-1.01)	-106.7 (-1.73)	-110.8 (-1.84)	-100.4 (-1.77)		-0.081 (-1.38)	-106.0 (-1.76)
Monitoring Lesser Procedures	141.5 (2.29)	121.0 (2.20)	96.5 (1.83)	92.4 (1.76)	117.1 (2.31)	0.088 (1.69)	100.1 (1.86)
Enteral Feeding/Gastrostomy	114.3 (0.69)	-160.4 (-0.97)	-162.2 (-1.00)		-342.6 (-1.96)	-0.084 (-0.54)	-142.6 (-0.88)
Enteral Feeding/Gastrostomy * Aide					787.9 (2.63)		
Infectious, Contagious and Parasitic Disease	268.8 (1.56)	145.5 (0.94)	22.8 (0.15)			-0.065 (-0.44)	-6.4 (-0.04)
Cardiopulmonary Serious	-117.5 (-1.85)	-3.0 (-0.06)	-2.7 (-0.06)			0.002 (0.04)	-11.7 (-0.21)
Cardiopulmonary Serious * Therapy					236.4 (1.65)		
Medication Supervision	-176.6 (-0.71)	36.1 (0.16)	13.6 (0.06)			0.107 (0.51)	13.0 (0.06)
Fracture/Paralysis: Upper Limb	267.6 (1.86)	80.4 (0.63)	62.7 (0.50)			-0.147 (-1.21)	21.0 (0.17)
Fracture/Paralysis Upper Limb * Therapy					782.3 (2.43)		
Fracture/Paralysis Lower Limb	159.8 (1.93)	38.9 (0.52)	29.9 (0.41)			0.024 (0.35)	26.2 (0.36)
Cancer: Serious	-44.8 (-0.70)	9.3 (0.16)	6.7 (0.12)			-0.014 (-0.26)	-4.2 (-0.07)
Cancer: Serious * Aide					106.6 (1.86)		
Benign Tumor/Limited Cancers	-132.8 (-0.80)	-87.8 (-0.60)	-100.3 (-0.69)			-0.102 (-0.73)	-120.2 (-0.83)
Psychiatric Monitoring	-139.2 (-0.72)	199.5 (1.16)	258.0 (1.53)	263.5 (1.64)	244.0 (1.56)	0.228 (1.40)	240.8 (1.42)
Cognitively Impaired	-244.5 (-0.90)	-79.4 (-0.33)	-24.7 (-0.10)			-0.201 (-0.87)	-17.0 (-0.07)

TABLE VII.1 (continued)

Independent Variables	Patient Characteristics Only	Nature of Care	Basic Model	Reduced Model (Stepwise)	Reduced Interacted Model (Stepwise)	Log Cost	Tobit
Urinary Incontinence	-103.9 (-1.19)	19.0 (0.24)	44.4 (0.56)			0.020 (0.26)	42.6 (0.54)
Urinary Incontinence * (Aide and Therapy)					713.0 (3.57)		
Urinary Catheter/Procedures	44.3 (0.32)	-37.2 (-0.30)	-35.4 (-0.30)		-197.5 (-1.54)	-0.148 (-1.27)	-41.0 (-0.34)
Urinary Catheter * Aide					833.3 (3.22)		
Kidney Disease	-107.8 (-0.64)	-38.7 (-0.26)	-59.7 (-0.40)			-0.160 (-1.12)	-71.4 (-0.48)
Bowel Incontinence	-393.2 (-3.46)	-157.9 (-1.56)	-134.7 (-1.36)			-0.344 (-3.59)	-169.2 (-1.70)
Wound--Not Complicated	137.8 (1.73)	41.1 (0.57)	58.3 (0.83)			0.091 (1.33)	56.3 (0.80)
Wound--Complicated	266.0 (3.68)	240.9 (3.62)	251.8 (3.87)	256.1 (5.00)	156.5 (2.72)	0.219 (3.46)	250.7 (3.85)
Wound Complicated * Aide					250.7 (2.47)		
Wound Complicated * Therapy					517.8 (2.96)		
Acute Serious Respiratory Disease	-87.9 (-0.97)	41.5 (0.51)	32.6 (0.41)			-0.010 (-0.12)	20.6 (0.26)
Neuromuscular/Degenerative: Serious	-175.2 (-1.35)	-246.2 (-2.11)	-230.5 (-2.02)	-239.2 (-2.29)	-174.6 (-1.73)	-0.090 (-0.82)	-230.9 (-2.03)
Neuromuscular/Skeletal: Less Serious	8.7 (0.11)	-58.3 (-0.86)	-61.0 (-0.92)			-0.074 (-1.15)	-66.7 (-1.00)
Head Injury/Surgery	619.7 (2.38)	305.3 (1.32)	286.1 (1.26)			0.221 (1.01)	289.9 (1.28)
Back Disorders	-23.0 (-0.26)	-89.0 (-1.11)	-104.1 (-1.33)			-0.140 (-1.84)	-119.0 (-1.51)
Back Disorders * Therapy					-220.6 (-1.57)		
Malnutrition/Dehydration/Electrolyte	-147.8 (-1.40)	-96.4 (-1.04)	-66.2 (-0.73)			-0.094 (-1.06)	-82.7 (-0.89)
Antibiotics	196.7 (1.11)	81.5 (0.52)	27.4 (0.18)			0.079 (0.53)	27.4 (0.18)
Anemias	-186.6 (-1.34)	-145.7 (-1.13)	-188.3 (-1.46)	-176.2 (-1.50)		-0.264 (-2.15)	-208.0 (-1.64)
Lymph/Blood Forming Tissues	-10.5 (-0.07)	-23.6 (-0.19)	-32.6 (-0.26)			-0.077 (-0.64)	-44.3 (-0.36)
Stroke	417.4 (5.29)	166.6 (2.26)	152.2 (2.13)	167.3 (3.20)	166.7 (3.29)	0.108 (1.57)	148.7 (2.08)
Hypertension/Cerebrovascular Disease	-59.6 (-0.71)	53.6 (0.71)	65.5 (0.89)			0.031 (0.44)	59.6 (0.81)
Acute Vascular Lesions/Aneurysms	-43.5 (-0.41)	16.1 (0.17)	4.1 (0.04)			0.027 (0.30)	-0.8 (-0.01)
Surgery on Blood Vessels	30.8 (0.40)	-111.1 (-1.62)	-138.1 (-2.05)	-125.8 (-1.97)	-90.2 (-1.47)	-0.131 (-2.01)	-149.7 (-2.23)

TABLE VII.1 (continued)

Independent Variables	Patient Characteristics Only	Nature of Care	Basic Model	Reduced Model (Stepwise)	Reduced Interacted Model (Stepwise)	Log Cost	Tobit
Peripheral Vascular Disease	142.4 (1.21)	135.4 (1.29)	147.7 (1.44)	146.6 (1.57)	193.0 (2.14)	0.015 (0.15)	144.2 (1.41)
Gastrointestinal Disorders	-187.8 (-2.13)	-121.7 (-1.56)	-132.1 (-1.72)	-117.1 (-1.85)	-113.9 (-1.85)	-0.145 (-1.96)	-147.9 (-1.92)
Miscellaneous Symptoms/Injuries	-82.8 (-0.66)	-81.3 (-1.15)	-75.2 (-1.08)			-0.088 (-1.31)	-92.2 (-1.33)
Equipment and Supplies							
Adult Diapers	189.7 (4.56)	81.7 (2.19)	89.4 (2.44)	84.7 (2.37)		0.067 (1.89)	90.1 (2.46)
Adult Diapers * Aide					134.5 (2.42)		
Enema, Bowel Kits	248.1 (4.66)	169.2 (3.38)	134.0 (2.73)	131.8 (2.96)		0.147 (3.10)	135.8 (2.84)
Enema, Bowel Kits * (Aide and Therapy)					381.4 (3.66)		
Respiratory Equipment	-97.8 (-2.19)	-126.2 (-3.08)	-128.1 (-3.13)	-102.3 (-2.77)		-0.106 (-2.78)	-130.8 (-3.25)
Respiratory Equipment * Aide					-145.8 (-2.31)		
Uses Either Cane or Crutches	56.5 (1.78)	50.8 (1.80)	47.5 (1.72)	51.5 (1.90)	57.4 (2.20)	0.060 (2.25)	54.0 (1.95)
Wheel Chair	125.2 (3.59)	62.7 (2.00)	61.0 (1.96)	60.9 (2.06)		0.049 (1.65)	66.7 (2.17)
Sensory, Cognitive, and Other Limitations							
Ambulation	145.8 (4.24)	64.8 (2.11)	61.5 (2.04)	59.9 (2.07)	43.2 (1.54)	0.097 (3.34)	66.7 (2.21)
Ambulation * Therapy					144.7 (2.47)		
Comatose	-357.2 (-1.91)	-265.3 (-1.57)	-166.2 (-1.00)			-0.263 (-1.64)	-173.7 (-1.04)
Hearing	59.2 (2.00)	3.7 (0.14)	3.3 (0.13)			0.013 (0.52)	4.9 (0.19)
Speech	115.2 (2.46)	19.1 (0.44)	9.9 (0.23)			0.003 (0.07)	6.7 (0.16)
Comprehension Difficulty	28.2 (0.77)	4.7 (0.14)	16.9 (0.52)			0.026 (0.84)	16.5 (0.51)
Communication Difficulty	-163.6 (-3.48)	-93.6 (-2.23)	-57.8 (-1.40)	-54.9 (-1.73)	-62.6 (-1.53)	-0.027 (-0.67)	-54.3 (-1.32)
Communication Difficulty * Therapy					190.3 (2.06)		
Communication Difficulty * (Aide and Therapy)					-165.3 (-1.89)		
Legally Blind	130.6 (3.22)	129.0 (3.56)	109.9 (3.09)	109.8 (3.15)	91.1 (2.72)	0.062 (1.79)	109.8 (3.09)
Activities of Daily Living							
Dependent in Bathing	80.7 (1.89)	-36.5 (-0.98)	-45.9 (-1.20)			0.012 (0.33)	-58.9 (-1.54)

TABLE VII.1 (continued)

Independent Variables	Patient Characteristics Only	Nature of Care	Basic Model	Reduced Model (Stepwise)	Reduced Interacted Model (Stepwise)	Log Cost	Tobit
Dependent in Bathing * Aide					-336.0 (-2.56)		
Dependent in Dressing	129.9 (3.06)	63.6 (1.69)	70.0 (1.90)			0.059 (1.66)	71.7 (1.94)
Dependent in Dressing * Aide					183.6 (2.86)		
Dependent in Dressing * (Aide and Therapy)					193.6 (2.05)		
Dependent in Feeding	-60.9 (-1.71)	-87.2 (-2.70)	-17.2 (-0.53)			-0.040 (-1.26)	-19.1 (-0.59)
Dependent in Medications	-7.8 (-0.26)	4.7 (0.17)	-16.6 (-0.61)			-0.043 (-1.63)	-15.8 (-0.58)
Dependent in Toileting	-0.4 (-0.01)	-30.9 (-0.92)	-28.8 (-0.87)			-0.018 (-0.57)	-23.9 (-0.72)
Dependent in Transferring	65.8 (1.62)	2.3 (0.07)	16.0 (0.51)			0.004 (0.13)	13.0 (0.41)
Severity of Illness Measures							
Discharged from Hospital < 14 Days Prior to Home Health	87.1 (3.07)	39.6 (1.56)	13.8 (0.55)			0.040 (1.66)	19.8 (0.79)
Discharged from SNH < 14 Days Prior to Home Health	268.6 (4.36)	68.8 (1.24)	71.4 (1.31)			0.023 (0.43)	75.0 (1.38)
Number of Home Health Visits 6 Months Prior to Home Health	6.4 (6.40)	4.1 (4.61)	4.3 (4.90)	4.4 (5.11)	4.1 (4.97)	0.004 (4.88)	4.3 (4.91)
Number of Hospital Admissions During Home Health Episode			184.6 (9.99)	187.4 (10.32)	173.5 (9.42)	0.208 (11.64)	187.6 (10.17)
Number of Hospital Admissions During Home Health Episode * (Aide and Therapy)					113.0 (1.98)		
Treatments--Skilled Nursing							
Foley Insertion		75.3 (1.36)	56.0 (1.03)	76.2 (1.65)		0.006 (0.15)	48.2 (0.88)
Bladder Instillation		254.7 (2.66)	269.6 (2.88)	260.6 (2.86)	305.8 (3.70)	0.321 (3.54)	267.9 (2.86)
Open Wound Care/Dressing		485.8 (14.79)	462.9 (14.37)	469.9 (15.58)	565.5 (15.02)	0.445 (14.28)	465.1 (14.45)
Open Wound * Aide					-166.6 (-2.75)		
Open Wound * Therapy					-234.0 (-2.14)		
Open Wound * (Aide and Therapy)					-294.1 (-3.09)		
Decubitus Care--Stage 3, 4, 5		175.7 (2.96)	167.8 (2.87)	172.5 (3.00)	167.6 (2.46)	0.207 (3.66)	177.3 (3.03)
Decubitus Care--Stage 3, 4, 5 * Aide					255.8 (2.24)		
Venipuncture		305.9 (10.89)	266.6 (9.63)	266.5 (9.95)	134.3 (3.72)	0.266 (9.92)	270.9 (9.79)
Venipuncture * Aide					256.4 (4.26)		

TABLE VII.1 (continued)

Independent Variables	Patient Characteristics Only	Nature of Care	Basic Model	Reduced Model (Stepwise)	Reduced Interacted Model (Stepwise)	Log Cost	Tobit
Venipuncture * Therapy					230.2 (2.66)		
Venipuncture * (Aide and Therapy)					344.3 (4.24)		
Restorative Nursing		31.8 (1.31)	16.0 (0.67)			0.054 (2.33)	18.3 (0.77)
Restorative Nursing * (Aide and Therapy)					194.8 (3.24)		
Bowel/Bladder Training		-32.9 (-0.80)	-49.5 (-1.22)			-0.032 (-0.81)	-46.5 (-1.15)
Adm. of Vitamin B-12		289.7 (2.61)	327.2 (3.01)	344.6 (3.20)		0.387 (3.66)	323.2 (2.97)
Adm. of Vitamin B-12 * Aide					491.4 (3.16)		
Adm. of Vitamin B-12 * (Aide and Therapy)					426.4 (1.96)		
Adm. Other IM/Subq		206.7 (2.66)	179.0 (2.35)	154.7 (2.06)	187.5 (2.44)	0.140 (1.89)	178.7 (2.34)
Adm. of Other IM/Subq					-390.1 (-1.74)		
Teach Gastrostomy Feeding		412.0 (3.19)	351.2 (2.77)	281.2 (2.54)	307.9 (2.57)	0.279 (2.27)	343.9 (2.71)
Teach Care of Tracheostomy		-47.9 (-0.28)	-79.9 (-0.48)			0.048 (0.30)	-72.0 (-0.43)
Teach Diabetic Care		229.3 (5.18)	216.7 (5.00)	193.1 (5.48)	229.5 (6.44)	0.177 (4.22)	212.0 (4.90)
Teach Diabetic Care * Therapy					-209.5 (-2.16)		
Decubitus Care-Stage 1, 2		137.0 (2.59)	146.0 (2.82)	149.7 (2.94)	161.4 (3.30)	0.156 (3.11)	151.1 (2.92)
<u>Treatment—Therapy</u>							
Any Physical Therapy (PT)		157.0 (2.58)	118.6 (1.99)	116.7 (2.02)		0.200 (3.48)	114.3 (1.92)
Any PT Care * (Aide and Therapy)					-261.7 (-2.66)		
PT Therapeutic Exercise		266.6 (4.34)	284.3 (4.69)	287.4 (4.84)	271.7 (5.57)	0.267 (4.56)	293.1 (4.84)
PT Transfer Training		80.7 (1.57)	72.2 (1.43)	73.5 (1.48)		0.036 (0.74)	70.4 (1.40)
PT Prosthetic Training		123.6 (0.90)	149.4 (1.11)			0.192 (1.48)	154.7 (1.15)
Any Speech Therapy		425.4 (3.10)	396.6 (2.94)	379.6 (2.91)	202.4 (2.13)	0.282 (2.17)	392.7 (2.93)
Speech Therapy Evaluation Only		-578.3 (-2.03)	-497.9 (-1.79)	-453.2 (-1.66)		-0.327 (-1.22)	-494.8 (-1.78)
Speech Articulation Disorders		362.5 (2.17)	347.3 (2.13)	377.7 (2.34)		0.164 (1.04)	347.4 (2.13)
Speech Articulation Disorders * (Aide and Therapy)					927.2 (5.59)		

TABLE VII.1 (continued)

Independent Variables	Patient Characteristics Only	Nature of Care	Basic Model	Reduced Model (Stepwise)	Reduced Interacted Model (Stepwise)	Log Cost	Tobit
Any Occupational Therapy		207.3 (2.79)	187.6 (2.56)	190.3 (2.65)		0.115 (1.63)	184.0 (2.53)
Muscle Re-Education		440.1 (4.06)	455.0 (4.30)	477.6 (4.56)	604.7 (7.36)	0.303 (2.96)	458.2 (4.32)
Any Social Work		85.2 (2.29)	84.6 (2.32)	84.3 (2.36)	92.0 (2.69)	0.164 (4.65)	89.7 (2.47)
Short Term Therapy with Social Worker		202.6 (2.48)	196.3 (2.45)	199.0 (2.52)	187.0 (2.44)	0.206 (2.67)	195.9 (2.45)
<u>Treatment--Home Health Aide</u>							
Any Home Aide		286.0 (6.89)	270.7 (6.65)	278.8 (7.09)		0.402 (10.20)	285.1 (7.01)
Partial/Complete Bed Bath		128.8 (3.22)	126.7 (3.24)	123.8 (3.24)		0.098 (2.55)	126.0 (3.23)
Bed Bath * (Aide and Therapy)					260.3 (4.19)		
Catheter Care		0.0 (0.00)	28.2 (0.39)			0.034 (0.49)	37.5 (0.52)
Assist with Ambulation		64.1 (1.69)	61.9 (1.66)	67.2 (1.83)	48.5 (1.47)	0.015 (0.41)	55.9 (1.50)
Exercises		167.2 (3.47)	156.0 (3.29)	158.2 (3.37)	96.5 (2.19)	0.045 (0.99)	150.5 (3.20)
<u>Nursing Interventions</u>							
Activity Care		-47.7 (-1.51)	-44.5 (-1.44)			-0.031 (-1.05)	-43.7 (-1.42)
Activity Care * (Aide and Therapy)					-133.5 (-1.52)		
Cardiopulmonary Condition		78.6 (3.01)	72.0 (2.88)	79.1 (3.41)	58.1 (2.47)	0.058 (2.33)	70.5 (2.82)
Cardiopulmonary * (Aide and Therapy)					179.8 (2.67)		
Other Condition		15.3 (0.63)	-7.3 (-0.31)			0.039 (1.68)	-7.5 (-0.32)
Other Bowel		44.4 (1.41)	33.9 (1.09)			0.033 (1.09)	34.9 (1.13)
Infusion Care		343.6 (4.92)	297.2 (4.34)	288.2 (4.32)	311.7 (4.85)	0.270 (4.07)	303.8 (4.44)
Mobility Therapy		5.1 (0.14)	1.3 (0.04)			-0.020 (-0.60)	1.0 (0.03)
Psychosocial Analysis		-90.1 (-1.64)	-57.3 (-1.06)			-0.028 (-0.54)	-54.5 (-1.01)
Respiratory Care		85.8 (2.14)	70.9 (1.81)	78.2 (2.09)		0.074 (1.95)	70.8 (1.81)
Vital Signs		112.2 (4.28)	103.7 (4.02)	99.8 (4.00)	99.2 (4.12)	0.081 (3.25)	107.9 (4.19)
<u>Response to Care</u>							
More Dependent			269.1 (4.77)	277.2 (5.16)	259.2 (4.95)	0.307 (5.63)	277.0 (4.90)

TABLE VII.1 (continued)

Independent Variables	Patient Characteristics Only	Nature of Care	Basic Model	Reduced Model (Stepwise)	Reduced Interacted Model (Stepwise)	Log Cost	Tobit
Less Dependent			53.3 (1.96)	49.0 (1.96)	39.9 (1.65)	0.116 (4.44)	61.0 (2.25)
Resolved			20.8 (3.16)	18.4 (2.91)		0.034 (5.35)	21.9 (3.32)
Resolved * Aide					33.8 (2.85)		
Resolved * (Aide and Therapy)					37.9 (2.48)		
Improved			27.5 (4.63)	26.5 (4.60)	22.7 (4.09)	0.037 (6.47)	29.4 (4.96)
No Change			-33.8 (-3.61)	-35.3 (-3.86)	-32.4 (-3.67)	-0.057 (-6.37)	-38.3 (-4.07)
Stabilized			12.8 (1.27)			0.030 (3.07)	15.3 (1.52)
Deteriorated			10.0 (1.07)			0.000 (0.02)	10.4 (1.11)
No Change			-33.8 (-3.61)	-35.3 (-3.86)	-32.4 (-3.67)	-0.057 (-6.37)	-38.3 (-4.07)
Artificially Shortened Episode - < 120 Days			-191.9 (-6.66)	-194.4 (-6.09)	-196.3 (-6.45)	-0.225 (-6.66)	-207.3 (-6.08)
<u>Demographics and Informal Caregiving</u>							
Under 65 Years Old	-6.0 (-0.13)	-50.7 (-0.96)	-60.5 (-1.16)			-0.012 (-0.23)	-56.8 (-1.09)
Between 75 and 85 Years Old	-75.2 (-2.62)	-64.4 (-2.52)	-63.8 (-2.55)	-56.0 (-2.37)	-34.2 (-1.64)	-0.035 (-1.45)	-64.1 (-2.56)
Over 85 Years Old	-128.4 (-3.31)	-100.3 (-2.90)	-96.1 (-2.80)	-85.8 (-2.76)		-0.076 (-2.33)	-103.2 (-3.04)
Over 85 Years Old * (Aide and Therapy)					-250.1 (-3.41)		
Female	27.8 (1.04)	13.9 (0.56)	12.3 (0.53)			0.022 (0.97)	15.4 (0.66)
Medicaid	-60.9 (-0.97)	-96.0 (-2.04)	-106.6 (-2.33)	-93.5 (-2.10)		-0.060 (-1.35)	-109.3 (-2.39)
Racial/Ethnic Minority	58.9 (1.66)	39.8 (1.42)	33.4 (1.22)			0.039 (1.47)	30.8 (1.13)
Lives Alone	-2.0 (-0.07)	23.2 (0.90)	37.4 (1.48)			0.018 (0.74)	35.5 (1.40)
<u>Missing Value Dummies</u>							
Missing Care Groups	-184.3 (-1.78)	-107.0 (-1.16)	-92.8 (-1.03)			-0.143 (-1.64)	-108.2 (-1.20)
Missing ADLs at Admission	-87.0 (-1.28)	-33.1 (-0.56)	2.0 (0.03)			0.099 (1.67)	11.0 (0.18)
Missing Treatments		366.3 (2.47)	340.4 (2.23)	311.9 (2.07)		0.204 (1.38)	334.5 (2.18)
Missing Nursing Interventions		-41.5 (-0.60)	-25.6 (-0.40)			-0.012 (-0.19)	-29.8 (-0.46)
Missing ADLs at End of Episode			63.9 (1.83)	57.6 (1.70)	68.2 (2.09)	0.042 (1.24)	66.1 (1.95)

TABLE VII.1 (continued)

Independent Variables	Patient Characteristics Only	Nature of Care	Basic Model	Reduced Model (Stepwise)	Reduced Interacted Model (Stepwise)	Log Cost	Tobit
Received Aide Care					436.1 (3.52)		
Received Aide and Therapeutic Care					506.7 (4.08)		
Intercept Parameter	416.8 (5.67	226.6 (3.37)	169.5 (2.63)	221.9 (6.10)	244.1 (7.12)	6.556 (85.88)	115.0 (1.72)
Standard Deviation of Tobit Equation							727.7 (97.53)
R^2	.1555	.3427	.3733	.3667	.4169	.4119	NA
$\bar{R}^2$	.1400	.3249	.3550	.3580	.4064	.3946	NA
Sample Size	4,862	4,862	4,862	4,862	4,862	4,862	4,862

NOTES: The patient characteristics only model includes only explanatory variables of the following types: comorbidities, diagnoses, equipment, limitations, dependent activities, severity measures, and demographics.

The care plan model includes all of the variables in the patient characteristics model, plus data from an initial care plan.

The basic model adds information from the end of the episode to that of the care plan model, including change in patient's number of ADL impairments and the number of intervening hospital stays.

The reduced model was developed using stepwise regression. All of the variables included in the basic model were eligible explanatory variables in the reduced model.

The reduced interacted model was also developed using stepwise regression. In this case, potential explanatory variables included the basic set plus the basic set interacted with binary variables indicating the skill mix of the care received.

The log costs model uses the same explanatory variables as the basic regression model but uses the natural logarithm of costs at 120 days as the dependent variable. The coefficients in this model are not directly comparable to those of the other models, given the different functional form. However, since the coefficients in the log model can be roughly interpreted as the expected percentage effect on cost of a one unit change in X, the coefficients from the log model can be compared to the basic regression coefficients divided by the sample mean of costs, $940.

The Tobit model uses the same variables as the basic regression model. Tobit coefficients are not normally comparable to OLS coefficients but because there are so few limit cases (about 2 percent of the sample), these values should be of comparable size.

NA indicates not available.

significant at the .10 level. Among the 7 continuous variables, 5 were statistically significant at the .10 level, and had relatively large effects on costs.

- In general, the variables that have the largest estimated coefficients are the treatments. Twenty-five of the 29 treatment variables had estimated coefficients greater than $59, and 21 of the coefficients exceed $118 (the cost of 2 skilled nursing visits.) Of the 21 coefficients exceeding $118, only one--Prosthetic Training--was statistically insignificant at the .10 level. Only 2 treatment coefficients were inconsistent with prior expectations--the negative coefficient on the patients receiving bowel/bladder training, and the negative coefficient on the patients receiving tracheostomy training. Neither of these coefficients were statistically significant at the .10 level.

- Of the 44 care group variables, 13 had coefficients with an estimated absolute value of $118 or greater, but over half (7) of these large effects were statistically insignificant at the .10 level. Patients in the limb amputation, complicated wound, and stroke care groups had large, statistically significant coefficients; suggesting that these patients used more home health services than patients without such conditions. These conditions were found in 658 of the patients; or approximately 13 percent of the sample. These results are consistent with prior expectations. Care groups for serious neuromuscular/degenerative diseases, surgery on blood vessels, and gastrointestinal disorders all had statistically significant coefficients less than negative $118. The result that patients with blood vessel surgery use less home health resources than patients without such conditions is inconsistent with our prior expectations.

- Of the 14 comorbidities identified by the clinical panel, 6 had coefficients with an estimated absolute value of $59 or greater, and 4 were statistically significant at the .1 level. Patients with a secondary diagnosis of limb amputation, incontinence, peripheral vascular disease or slow wound healing conditions used more home health on average; patients with limb amputations used an estimated $709 more home health resources. In contrast to our expectations, patients with a secondary diagnosis of diabetes were predicted to use less home health care than those without such a condition--an estimated $65 less, which was statistically significant. However, we expect that this anomaly may be due to colinearity between the treatment code variable for teaching diabetic care and the diabetes comorbidity indicator.

- Only 1 of the 6 coefficients on ADL variables had an absolute value greater than $59. The model estimates that patients who are dependent in dressing use more home health services, which is consistent with our prior expectations. However, we expected that the other ADL measures would also have significant predictive power, which they did not. Apparently, treatment and care group variables capture the influence of ADL impairment on service use.

- Of our 4 severity of illness measures, 2 were statistically significant at the .10 level. Being admitted to a hospital during an episode increases the amount of home health utilization--each within episode admission adds $184 to the cost of an episode, approximately the cost of three additional skilled nursing visits. The coefficient on the number of home health visits suggests that an episode of median length (20 visits) in the previous six months increases the current episode costs by $85.60--slightly more than one nursing visit.

- Of the 8 response-to-treatment variables, 7 were statistically significant at the .10 level. The deteriorating ADL status variable had the largest effect, an increase of $269 in costs.

- A truncated episode is predicted to cost $191 less than a completed episode.

- Of the 12 variables measuring equipment and supply use and limitations of various kinds, 6 had estimated coefficients that were greater than $59 and statistically significant at the .10 level. The only counter-intuitive result is that patients on respiratory equipment cost $126 less than patients who are not on respiratory equipment.

- Of the 9 nursing intervention codes, 4 coefficients were greater than $59 and were statistically significant. The largest coefficient is on the nursing intervention code for infusion therapy--patients with infusion therapy are predicted to cost $297 more than patients without infusion therapy.

- Of the 7 demographic variables, 3 coefficients were greater in absolute value than $59 and statistically significant at the .10 level. Two of these were the age category variables, which show the counter intuitive result that older patients use less home health care.

The estimated coefficients are generally consistent with intuition, but there are a few exceptions. Whether these are due to small cells, unspecified interaction terms, multicolinearity, or some other reason has not been determined.

2. Alternative Specifications of the Regression Model Using Data Available at Different Points in Time

To use the basic model presented above in a casemix system would require that the patient's payment rate be set after patient outcomes are known. That is, one must know whether the patient experienced: (1) a resolution of their health problems, (2) a change in ability to perform ADLs, (3) a truncated episode, or (4) a within-episode hospital admission. Whether or not this type of payment system is feasible for home health care depends upon a number of factors, including whether the government is willing to require agencies to submit outcome data at discharge. For example, assessment of whether an episode was truncated depends on discharge destination. Discharge destination on the MADRS records has always been demonstrated to be invalid, and therefore is rarely used. Thus, while using these variables improves the fit of the model, it will be substantially more costly and burdensome to implement a case-mix adjustor that requires such data.

To determine how critical these hard-to-obtain variables are to the accuracy of the model we have run two different regression models under alternative restrictions about the point by which the data must be available for use in the model. The first model assumes that data are available on patient characteristics at intake and on nature-of-care variables (treatments and nursing interventions), but data on subsequently occurring events are not available. The second model assumes that the only data available are patient characteristics at intake--no nature-of-care data are included.

The results show that including data for the nature of care is crucial; there is a large loss in variance explanation when the treatment and nursing intervention variables are dropped, whereas the loss of within-episode data does not significantly alter the regression model. The first regression, presented in Column 2 of Table VII.1, excludes all of the variables that are based on within-episode or end of episode information, such as the number of within-episode hospital admissions, the change in ADL status, and the number of problems resolved. The key results from this regression are:

- The adjusted R-square--a measure of variance explanation--decreases from .36 in the basic model to .32 in the limited data model.
- The majority of the coefficients were fairly stable, that is, they changed by less than $59 across the two models.
- The coefficients that did change significantly do not appear to have a pattern. Two of the comorbidities (depression and paralysis), three of the care groups (infections, psychiatric monitoring, and antibiotics) and two treatment variables (teach gastrostomy feeding and speech therapy) had large changes in their coefficients, as did the variables measuring patients' ability to feed themselves and whether they were comatose at the time of admission.
- As in the basic regression, the large, significant coefficients are primarily on the treatment variables.

These results suggest that if we were to limit the case-mix system to variables that are known at the time of the home health admission and nature of care variables, the explanatory power would not be greatly compromised.

Our second regression demonstrates that using only patient characteristics would seriously compromise our ability to predict home health utilization. The key results from this regression (see Column 1 of Table VII.1) are:

- The adjusted R-squared drops sharply from the basic model--from .35 to .14.
- A large number of the estimated coefficients change dramatically. The biggest changes are in the estimates of the care group coefficients, where 28 of the 44 coefficients change by over $59; and some change from negative to positive, and vice versa.

In summary, our basic regression analysis suggests that treatments are the key variables for predicting home health utilization. The treatment codes do not specify the duration or intensity of care required. However, the close relationship between cost and the treatment variables raises the logical question of whether such variables are "endogenous." Is it, in effect, "cheating" to include such variables in the regression model predicting cost when these variables effectively dictate one of the key determinants of the total cost of an episode--the skill mix required to treat the patient?

We believe that including such treatment variables in the model is appropriate. The skill mix for a home health patient can be viewed as somewhat analogous to the DRG categories used to compensate hospital for hospital stays. The agency should be compensated for the mix of services its patients are likely to require, since this is one of the key factors determining the complexity of an agency's case-mix. How many visits, the frequency and length of visits, and the efficiency with which they are provided are the factors which the agency should be free to vary in serving the patient effectively and efficiently.

B. EMPIRICAL REFINEMENTS TO THE MODEL

In order to potentially improve upon the predictive power of the basic model, we investigated several empirical issues concerning this model. These include the following:

- The distribution of the dependent variable, cost of the episode (for up to the first 120 days), is somewhat skewed to the right and always positive. Would using the more

normally distributed natural logarithm of costs as the dependent variable and then transforming the estimates lead to a better prediction of costs?

- Patients with different care needs may have different determinants of home health costs. Therefore, do we improve our model by allowing for interactions between the skill mix of the care received and the explanatory variables?

- With 133 coefficients, the OLS model is bulky and its data collection requirements large. Furthermore, there may be some "overfitting" of the data with so many parameters. Thus, we want to know whether a smaller, more parsimonious model can provide us with the same or with better predictive power as the basic model.

- The regression model predicts some costs as small or negative values. However, for the purpose of devéloping a case-mix adjuster, values of less than the cost of one registered nursing visit are not valid. Therefore, we tested a technique that creates a lower bound at $59.

In the next four sections, we will discuss these empirical issues and the results of our analysis of them.

1. Using the Logarithm of Cost As the Dependent Variable

The distribution of our measure of standardized cost is not a bell-shaped curve as assumed by the regression model; while most expenditures cluster near the mean, costs are bounded below at the cost of one skilled nursing visit ($59), and there are a number of extremely high values that skew the distribution. Taking the natural logarithm of costs reduces the weight given to these extreme values, and yields a distribution of the dependent variable that is much more nearly normal. In addition, this process of pulling in the extreme values helps to reduce problems of heteroskedasticity, since the variance in cost around the regression line may be larger for higher values of cost. Elimination of heteroskedasticity can yield more efficient coefficient estimates. The use of logarithms also guarantees then the predicted value for costs from the estimated model will always be positive. Finally, when the dependent variable is expressed in terms of logarithms the coefficients can be interpreted in terms of the percentage change induced in cost by a unit change in the regression. In certain circumstances, this interpretation of the coefficients is simpler and makes comparisons easier.

To investigate these potential benefits, we created a new variable--the logarithm of costs and regressed this on the full set of independent variables. We then used the estimated equation for log

cost to predict cost by multiplying the antilog of the predicted value for log cost by a factor (f) necessary to eliminate the bias in the expected value of predicted log cost. This factor is derived by computing the expected value of costs, $E(C_i)$, from the log cost model:

$$\begin{aligned}
\ln C_i &= X_i b + u_i \\
E(C_i) &= E[\exp(X_i b)\exp(u_i)] \\
&= \exp(X_i b)\, E[\exp(u_i)] \\
E[\exp(u_i)] &= f = \frac{1}{n}\sum \exp(\ln C_i - X_i b) \\
&= \frac{1}{n}\sum C_i \,/\, \exp(X_i b)
\end{aligned}$$

The factor f, referred to by Duan et al (1982) as a smearing adjustor, yields somewhat more robust estimates of the expected value of the unlogged variable than does the usual formula for estimating this expected value from a regression on the logged variable.[1] It is also important to note that because this analysis uses a different dependent variable than the basic model, the R^2 and the coefficient values cannot be compared directly to those of the basic model. However, we can compare each model's ability to predict actual costs by plugging in values from the holdout sample.

We find that the log regression model yields poorer predictions of cost than the unlogged regression model:

- The log regression model over-predicts costs on average by 2.3 percent in the holdout sample.

- The log regression model has a mean squared difference between actual and predicted costs, $\Sigma(C_i - \hat{C}_i)^2/n$, for the holdout sample that is 25 percent greater than that of the logarithmic model. *(The root mean squared error is about 12 percent greater for the logarithmic model.)*

- Essentially the same variables show up in both regressions as being important in determinants of cost (compare Column 6 and Column 3 of Table VII.1).

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[1]The expected value of the disturbance term u_i is actually equal to $\exp(s^2/2)$ if u_i is distributed log normal, where s^2 is the variance of u. The smearing adjustor yielded less biased estimates of cost than did the factor $\exp(s^2/2)$ in our sample.

Since using the natural logarithm of costs as the dependent variable leads to an upward bias and greater mean squared difference between actual and predicted costs in the holdout sample, we continue to use non-logged costs as our dependent variable.

2. Separate Models for Skill Mix Groups

The relationship between cost and patient characteristics may be very different for patients receiving different types of care. Receiving nursing, aide, and therapeutic care may indicate a vastly different situation than receiving nursing care alone. Accordingly, we may be able to improve our cost predictions by including in our regression model interactions between the skill mix of care a patient received and certain predictive variables.

In order to test this hypothesis, we identified four exclusive skill mix groups: (1) nursing care only, (2) nursing and aide care, (3) nursing and therapy care, and (4) nursing, aide, and therapy care, for which we estimated separate regression equations.

	Nurse Only	Nurse + Aide	Nurse + Therapy	Nurse + Therapy + Aide
Mean Cost	635	1,100	1,032	1,819
Standard Deviation	732	827	770	1,147
Number of Episodes in Sample	2,526	1,209	523	598
Number of Parameters	125	129	134	137

Patients receiving only nursing care who comprise over half of the sample, had the lowest average home health costs. The average cost of patients receiving nursing, aide and therapeutic care (about one-eighth of the sample) was three times as large. It is important to note, however, that the

standard deviations are large even given the fairly large sample sizes. Thus, there remains a great deal of variation in expenditures within groups.

We find that this method of allowing full interaction of the independent variables with binaries for the four skill mix types appears to predict home health expenditures somewhat more accurately than the basic model, but quadruples the number of parameters in an already large model. In addition to being unwieldy and difficult to interpret, inclusion of so many parameters would lower the model's efficiency, since the coefficients for the majority of the variables do not differ markedly across the four groups. The primary results of allowing full interaction of the independent variables with the skill mix that a patient received include the following:

- The R^2 of the fully interactive model in the estimation sample is .47; the adjusted R^2 is .41. The sum of the squared residuals for this model is about 20 percent smaller than that of the basic model. This difference is statistically significant with $F_{(388,4331)} = 2.135$.
- Several variables that appeared to be unimportant in the basic model emerge as important determinants of cost for patients receiving certain types of care. For example, having a secondary diagnosis of paralysis appeared to be unimportant in determining costs in the basic model. However, when this variable is interacted with the type of care received, it becomes clear that a comorbidity of paralysis in patients receiving therapy care represents an additional use of several hundred dollars worth of care over similarly diagnosed patients not receiving therapy care.

3. A More Parsimonious Regression Model

The basic model includes about 130 variables, constructed from several thousand possible explanatory variables; yet even this model is too large to be ideal. Many of these variables are not important to predicting cost. This situation arises in part because the data for many of the constructs in the model are represented by a group of binary variables, all of which are not important for predicting cost, even though the construct may be. For example, there are 13 conditions included as comorbidities. While certain conditions surely affect home health costs, others are likely to be extraneous. Eliminating these ineffective variables may lead to more precise predictions of costs.

To investigate the possibilities for paring down the regression model to only the most important determinants of home health costs, we used step-wise regression. Step-wise regression creates a leaner model by adding and removing variables based solely on their ability to increase the model's overall F-statistic (or, equivalently, the R^2 statistic adjusted for degrees of freedom). Essentially, the computer starts with a model with no explanatory variables, calculates the potential change in the F-statistic of adding each of the possible variables, and selects the one that provides the greatest increase. This technique is then repeated by adding variables (or removing those that lose their importance as the model grows) one at a time, based on their ability to increase the proportion of explained variance until there are no variables that can increase the F-statistic noticeably.

This technique yielded a model that has less than half as many parameters and retains the variables that we know from our other work on developing a case-mix adjustor (see below) to be the most important. The final regression results of this model are in Table VII.1 (Column 4). The key results of this analysis are:

- The step-wise technique created a model that utilizes 64 of the 133 independent variables included in the basic model. For 56 of these variables, the absolute value of the estimated coefficients exceeds $59.

- The model explains 37 percent of the variance in costs. The adjusted R^2 increased slightly from .35 in the basic model to .36 in the parsimonious model. This suggests that the efficiency gains in using a smaller model more than compensate for the loss of the information contained in the variables cut from the model.

- As was the case in the basic model, treatment variables continue to play an especially important part in predicting cost: over one-third of the included variables are treatment indicators and they have the largest estimated coefficients. All of the 24 coefficients on treatment variables are greater than $59; 19 of the 24 have values greater than $118. All of the coefficients were consistent with prior expectations.

- 12 of the 64 variables included in the step-wise regression were care group variables. All 12 had coefficient values greater than $59 (or less than -$59); 9 have values at least twice this size. All of the care group variables included in the step-wise regression were of similar sign and magnitude as the basic regression model. The primary difference is that three variables with sizable coefficients in the basic regression model--head injuries, bowel incontinence, and enteral feeding--were not included in the more parsimonious model.

- Five of the six comorbidities that in the basic model had estimated absolute values of $59 or greater were included in the step-wise model. Only neurological disease, which did not have a statistically significant effect in the basic model, was excluded from this model. The estimated coefficients of the five comorbidities were similar to those in the basic model.

- None of the ADL variables were included in the step-wise model. This is not surprising, since the coefficients of ADL variables in the basic model were generally small and insignificant.

In addition, we used step-wise regression to develop a more parsimonious version of the model incorporating interaction terms. The results of this procedure are given in Table VII.1. Step-wise regression produced a model containing only 93 variables, far fewer than including the variables interacted by a skill mix dummy variable for a single type of care received. The R^2 for this model is .42; the adjusted R^2 for this model is .41. Also, the sum of the squared residuals is significantly less than in the step-wise regression model without the skill mix interactions.

Overall, we found these more parsimonious models to be quite attractive, as they removed much of the excess burden of the basic and interaction models while losing very little predictive power. Using both the basic reduced model and the interacted reduced model on the holdout sample, we found the interacted model did only slightly better, producing a sum of the squared errors that was only about 1 percent lower. As the non-interacted model has one-third fewer parameters, nearly as good a fit and is simpler to interpret, the basic reduced model is our preferred regression model.

4. The Tobit Model

The Tobit model is a statistical model that always yields predicted values greater than some chosen lower bound, and allows the dependent variable to be expressed in its natural (unlogged) form as a linear function of explanatory variables. Tobit was designed for use in place of regression when the dependent variable is truncated at some point, often at zero, and there are sample observations with the limit value. For example, the relationship between individuals' expenditures (for medical

care, automobiles, etc.) and their personal characteristics is often estimated using a Tobit model because many sample individuals will have zero expenditures.

The Tobit model is expressed as follows: Let Y^* be the "desired" or optimal value of the dependent variable, which may be less than the limit value. However, the amount we observe (Y) is equal to the desired amount only if Y^* is greater than the limit value (L). If the desired value is below the limit, we observe the limit value. Thus:

$$Y^* = Xb + u$$

$$Y = Xb + u \text{ if } Y^* > L \text{ (i.e., if } u > L - Xb)$$

$$Y = L \text{ if } Y^* \leq L \text{ (i.e., } u \leq L - Xb),$$

where X is a row vector of explanatory variables, b is a coefficient vector, and u is assumed to be distributed normally with mean 0 and variance s^2. The parameters b and s^2 can be estimated by maximum likelihood, with limit observations contributing to the likelihood function the term F((L-Xb)/s), the predicted probability that the observation is a limit value, and other observations contributing the term f(Xb/s), the normal density function evaluated at Xb/s.

Once the parameters are estimated, the Tobit model can then be used to estimate the expected value of Y for any set of values X as follows:

$$E(Y) = \text{Prob}(Y^* > L) * E(Y \text{ given } Y^* > L) + \text{Prob}(Y^* \leq L) * L$$

$$= [1 - F(.)] * [Xb + sf(Xb/s)/F(.)] + F(.) * L$$

where (.) = (L-Xb)/s. This value will always be greater than L, because the factor sf(Xb/s)/F(.) ensures that E(Y given Y^*>L) must be greater than L.

We have adapted the Tobit model to our problem by treating values of $59 or less (the cost of one nursing visit) as limit observations and setting L = $59. This approach guarantees that predicted values obtained from the expression for E(Y) will be $59 or greater for each case, but the estimates

should otherwise be comparable to those obtained from regression. Our expectation was that by explicitly accounting for the fact that all costs are positive we might be able to obtain more efficient estimates. There are 88 observations with costs of $59 or less in our sample of 4,862 cases.

The estimated coefficients of the Tobit model (Column 8 of Table VII.1) were in fact very similar to those of the basic regression model (Column 3). The coefficients rarely differed by more than one-quarter of one standard deviation. More importantly, the model yielded over twice as many negative predicted values for Xb as regression. However, since the adjustment term sf(X/(s)/F(.) typically adds between $400 and $500 to these negative values, the minimum predicted value, $170, is fairly high. The 1 percentile of predicted values from the Tobit is $329, compared to the 1 percentile of $59 for actual costs.

Given these findings it is not surprising that the Tobit model overestimated costs on average. The average predicted value for the holdout sample is nearly 6 percent greater than the actual average cost of $939.

On other measures of fit the Tobit model does quite well, however. The mean squared error is the same as the regression model, and the mean absolute deviation is only slightly (2.5 percent) larger than regression. The mean percentage deviation (101 percent) is large and somewhat greater for the Tobit model than for regression, but the range of errors between the 20th and 80th percentiles is comparable (smaller underpredictions and larger overpredictions, as expected).

The upward bias in the Tobit estimates precludes its use for developing a case-mix adjustor. Even if this problem were resolved, however, Tobit would have to yield substantially better estimates than regressions to warrant the greater complexity it entails.

VIII. RESULTS FROM THE CART PROCEDURE

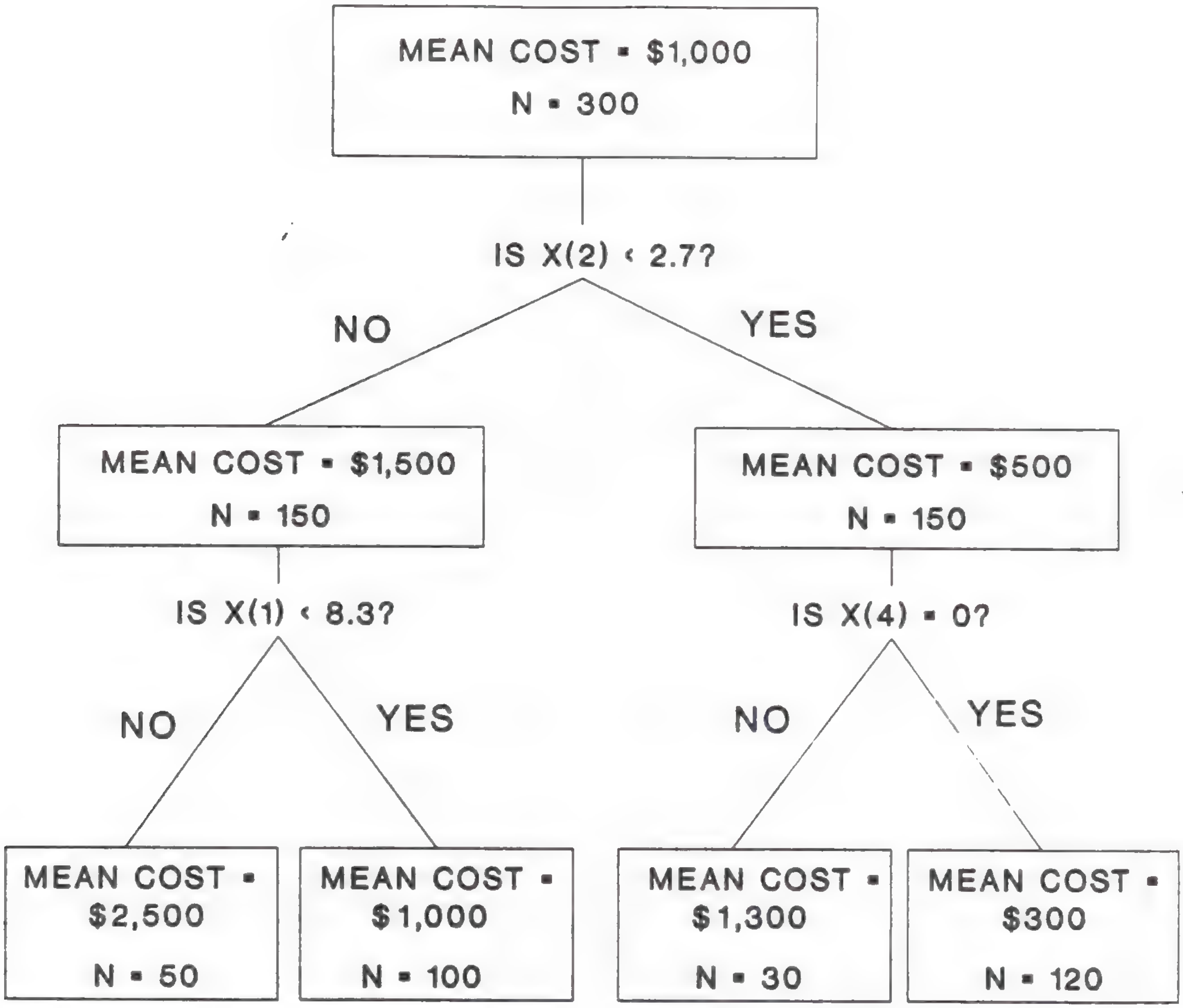
A. THE CART STATISTICAL PROCEDURE

The Classification and Regression Tree (CART) procedure uses data to form prediction rules for a dependent variable based on the values of independent variables. A nonparametric statistical method is used to "optimally" assign individuals to cells based on the explanatory variables that best discriminate among individuals on the dependent variable. The dependent variable is allowed to be either categorical or continuous, as are the variables in the independent set. CART constructs prediction rules by forming binary decision trees, where at each node individuals are assigned to one of two groups depending on their values of the "best" chosen independent variable. The procedure allows for full interactions among the variables in the independent set.

The procedure can best be understood through the use of an example, where it is assumed that the dependent variable is standardized cost. Figure VIII.1 displays a hypothetical CART prediction tree where there are three hundred individuals and an overall mean value of $1,000. It is assumed that X(1), X(2), and X(3) are continuous explanatory variables, and that X(4) is a binary categorical explanatory variable. The tree shows that an individual is initially assigned to one of two groups depending on whether or not his/her value of X(2) is less than 2.7. Half of the individuals have X(2) values smaller than 2.7, and this group has an average cost of only $500. Those with $X(2) > 2.7$ have mean costs of $1,500. The members of the group who have X(2) values less than 2.7 are further split into two groups based on their X(4) values, while the remaining 150 individuals are divided according to whether or not their X(1) values are less than 8.3. The resulting tree contains four terminal nodes with very different means and sample proportions.

The tree in Figure VIII.1 can then be used to predict cost for a case whose X(1),...,X(4) values are known. The case is run down the tree, moving right or left according to the values of the relevant independent variables until it arrives at a terminal node. The case is then assigned a

FIGURE VIII.1
EXAMPLE OF CART PROCEDURE ON EPISODE COST
WITH HYPOTHETICAL EXPLANATORY VARIABLES X(1)-X(4)



predicted value for cost equal to the actual mean for individuals in the estimation sample who were allocated to that terminal node. For example, an individual with X(2)=1.8 and X(4)=1 would be assigned a predicted cost of $1,300.

To identify the "optimal" split at each node, the CART procedure first determines the binary split on **each** variable that minimizes the weighted average of the within-node sample variances of the dependent variable Y, where the weights are proportional to the node sizes. The splitting rule then compares the alternative choices **across** independent variables and chooses the split that minimizes this weighted average. The splitting rule can be written in equation form as follows:

$$(2) \quad \min \sum_i \sum_j W_i \, (Y_{ij} - \overline{Y}_i)^2$$

where W_i is the proportion of cases in the sample assigned to the ith cell, Y_{ij} is the cost for the jth individual assigned to the ith group, and $\overline{Y}_i$ is the mean cost for the cases classified in the ith group. We note that it may be preferable to use a least absolute deviation criterion rather than a least squares criterion in the calculations, since the former metric is more robust to outliers than is the latter metric. The splitting criteria is then,

$$(3) \quad \min \sum_i \sum_j W_i |Y_{ij} - Y_i^m|$$

where Y_i^m is the median cost for the individuals in cell i, and the predicted value in any node is Y_i^m.

The obvious question now is: How long do we keep on splitting? It is clear that a tree could be created where each terminal node contains exactly one observation. This tree would have a perfect fit for the estimation sample, but would not predict well in another sample. In order to estimate which tree has the smallest true error rate, we proceed as follows:

(1) Randomly allocate a certain proportion of the original sample to the "learning" sample and allocate the remaining cases to the "test" sample.

(2) Use the learning sample to create the tree and continue splitting until each of the terminal nodes consists of less than a given number of observations (e.g., five), creating a "large" tree.

(3) Again using the learning sample, use an algorithm to selectively prune branches off this large tree to create a sequence of smaller and smaller trees. The algorithm finds the branch for which the increase in sum of squared errors resulting from eliminating that split, divided by the number of terminal nodes eliminated, is smallest (ie., the smallest loss in prediction per degree of freedom gained). The algorithm results in a sequence of trees, each of which has the lowest sum of squared errors of all trees of the same size.

(4) Use the test sample to estimate the true error rate of the trees. The cases are run down each of the trees according to the values of their independent variables, and a predicted value is generated for each case. The true error rate for a given tree is estimated to be the sum of square deviations (or minimum absolute deviations) for the test sample.

(5) The "optimal" tree can be chosen to be the smallest tree that has an estimated sum of squared errors that is within some tolerance of the smallest sum of squared errors among the sequence of trees. The CART manual suggests a tolerance of one standard error in order to reduce the effects of outliers, and to obtain an easily interpretable tree with relatively few nodes that has an error rate close to the one corresponding to the "best" tree. In practice, however, the analyst must decide which tree is "optimal" based on the change in the sum of squared errors as the tree size decreases, and on the size of the cells.

One particularly attractive feature of CART is its ability to handle missing data by performing "surrogate splits". Referring back to Figure VIII.1, the event $\{X(2) < 2.7\}$ defines the best initial split of the tree. Suppose, however, that individual i lacks data on the value of X(2). In order to decide to which branch this individual should be allocated, CART searches through all possible splits on other variables and ranks these splits by how closely they mimic the "best" split. Thus, if the best surrogate split is defined by the event $\{X(3) < 4.6\}$ and X(3) is not missing for individual i, the case will be assigned to the left or right node depending on the value of X(3).

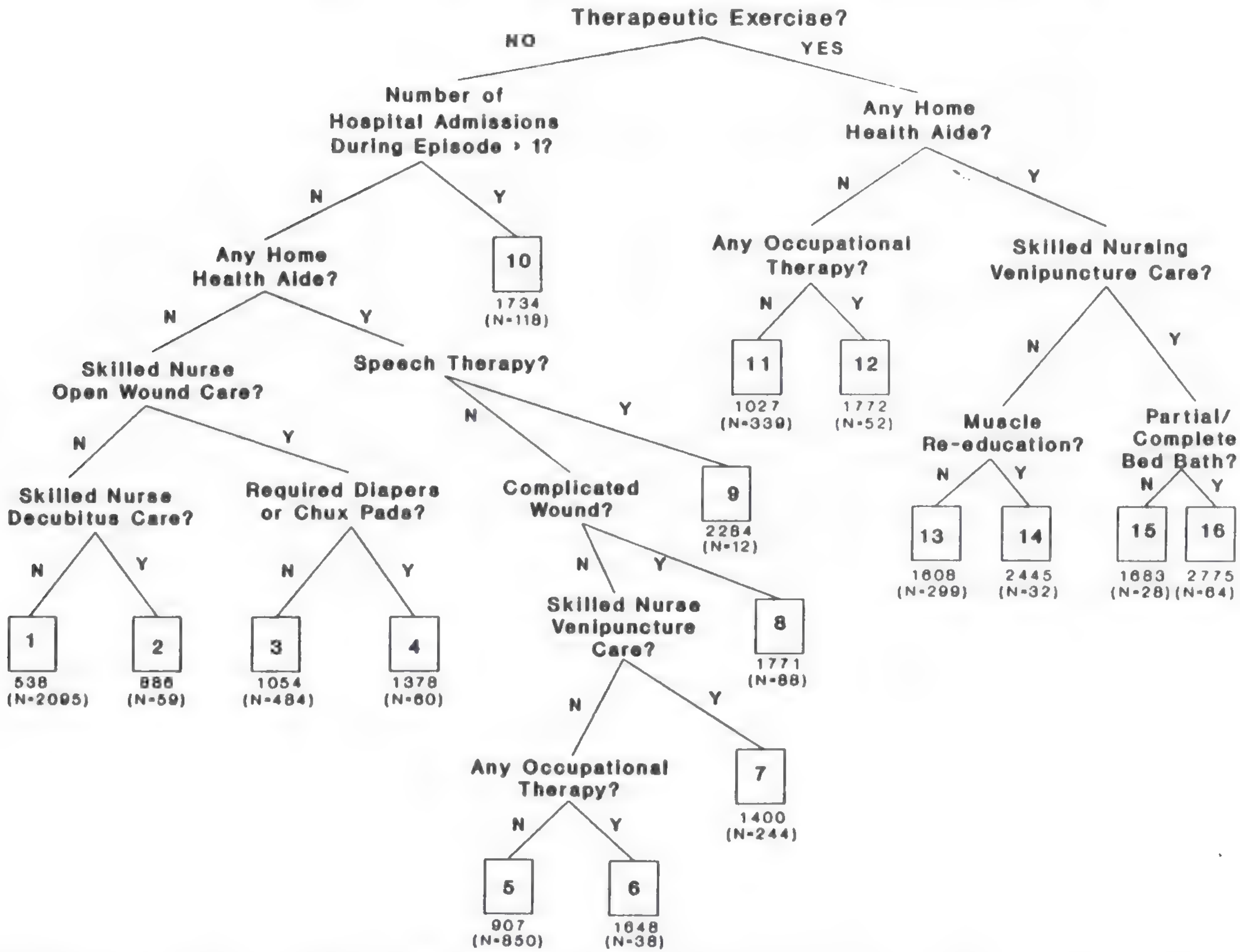
B. THE OPTIMAL CART MODEL

Figure VIII.2 displays the estimated CART tree for home health costs that was used to generate the CART results in chapter II. The tree was created using the sample of 4,862 individuals, 25 percent of which was allocated to the test sample. The least squares splitting criteria shown in equation (2) was used to choose the "best" split at each node. The figures in boxes at the bottom of the tree represent terminal node numbers, and the two rows of figures below a given box correspond to the average cost of the individuals in the node, and to the number, N, of individuals in the node, respectively. Both the predicted costs and N are based on the entire sample of 4,862 individuals, although the tree was generated using only the members of the learning sample.

We have constructed other trees using the CART procedure (see section C. below), but for the purposes of this section, we focus only on the tree displayed in Figure VIII.2 for two reasons. First, in relation to the other tested trees, the displayed tree performs consistently well on the goodness-of-fit statistics discussed in Chapter II (R, RMSE, MAD, PAD etc.). Thus, the displayed tree is representative of how well CART can predict home health costs. Second, as will be discussed below, there are clear and intuitive differences between the characteristics of individuals who are classified in the different terminal nodes.

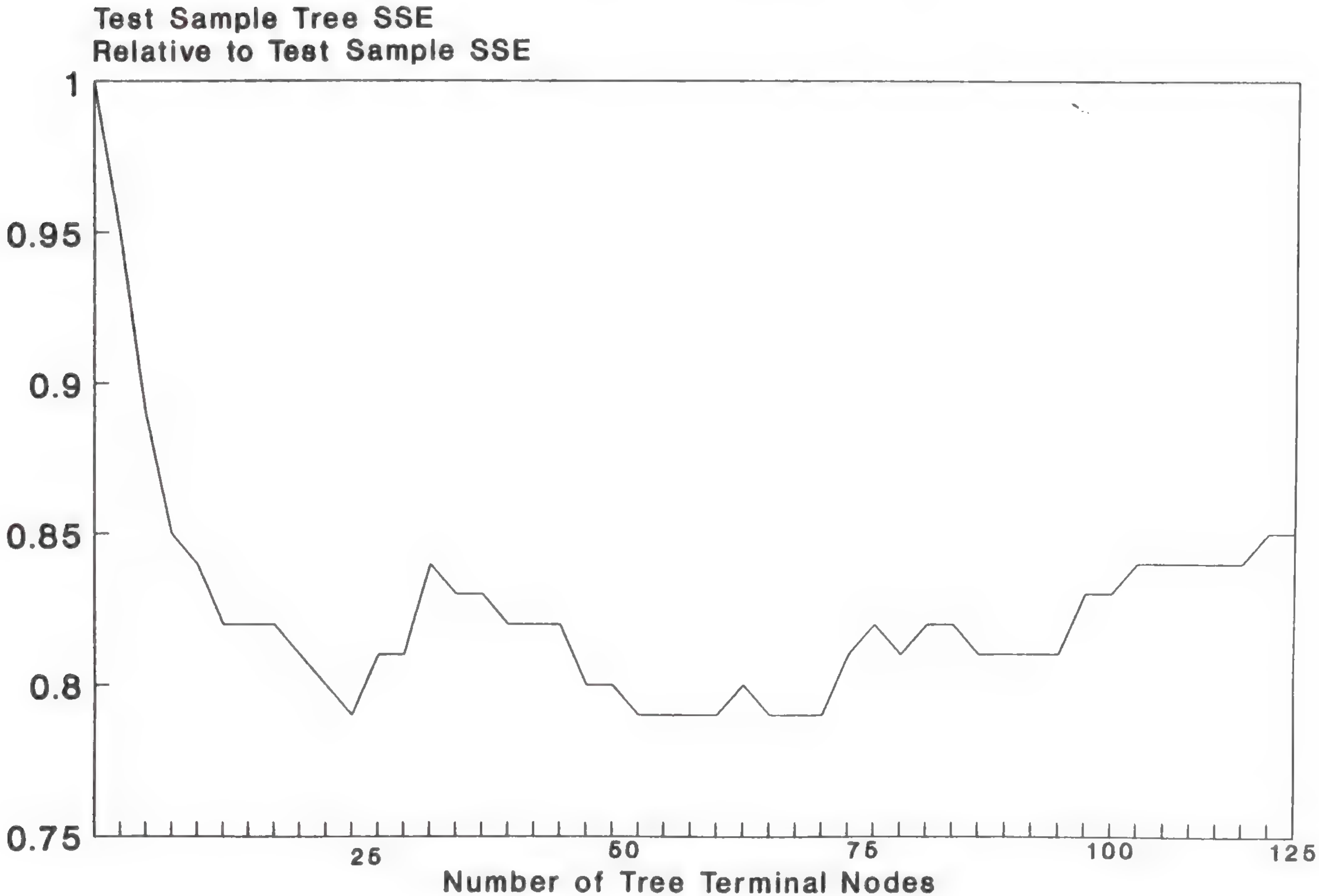
The tree displayed in Figure VIII.2 contains sixteen terminal nodes. The tree that generates the smallest sum of squared errors in the test sample contains sixty-four terminal nodes. However, this tree does not perform noticeably better than trees half its size, and contains many cells with very few cases. In order to choose among the sequence of trees generated by the CART procedure, we used a feature of the technique that relates the number of terminal nodes to the test sample error. As one moves from large to small trees, the test sample error initially decreases fairly rapidly, but then remains relatively constant for many trees until it gradually increases (see Figure VIII.3). The tree with twenty-four nodes was chosen since it is the smallest tree with virtually the same sum of squared errors as the tree with minimum value. We then collapsed the twenty-four node tree further since

FIGURE VIII.2
CART TREE USED IN ACCURACY COMPARISONS



NOTE: Numbers based on entire sample of 4,862 individuals. The numbers in the boxes indentify the terminal nodes. Number in parenthesis represent the number of cases in the terminal nodes. Numbers directly below a box represent the average costs for those in the nodes.

Figure VIII.3
Plot of Test Sample Tree Sum of Squared
Errors Against Number of Tree Terminal Nodes



several of its terminal nodes contain only a small number of learning sample members (less than twenty individuals; several had only one or two). Results for the test sample seemed to indicate that most of these small cells tended to be due to rarely occurring values for some independent variables within the parent node, rather than to a true relationship. However, in a few instances small cells were preserved. For each of these cells the difference in means observed in the learning sample between the small node and its complement was also observed in the test sample.

There are twelve explanatory variables that enter the displayed tree, nine of which are treatment codes. The only non-treatment code variables that appear are the number of hospital admissions during the home health episode, a dummy variable signifying whether or not the patient required diapers (chux pads), and a dummy variable representing whether or not the patient had a complicated wound.

Individuals are uniquely allocated to one of the sixteen terminal nodes depending on their explanatory variable values, and Table VIII.1 displays summary tree information. Individuals in nodes 1 and 2 did not receive any therapeutic exercise treatment, had one or no hospital admissions, did not require a home health aide, and did not require skilled nursing open-wound assistance. Since these nodes are defined primarily by what the patient did not need, they have the smallest mean reimbursements. Over 43 percent of the individuals in the sample were categorized into terminal node 1. Node 3 and node 4 cases differ from cases in nodes 1 and 2 since they received open-wound care. The cases in nodes 5 through 9 did not receive therapeutic exercise treatment, but did receive some form of home health aide. These individuals differ from one another depending on whether or not they received speech therapy, occupational therapy, or skilled nursing venipuncture care, and whether or not they were diagnosed as having a complicated wound. Node 10 individuals are primarily characterized as individuals who were admitted to the hospital two or more times during the home health episode. The cases in nodes 11 through 16 all received therapeutic exercise treatment. In addition, node 12 individuals received occupational therapy, and individuals in nodes

TABLE VIII.1

TERMINAL NODE SUMMARY FOR THE OPTIMAL CART MODEL

Node	N	Predicted Cost	Therapeutic Exercise	Number of Hospital Admissions During Episode	Any Home Health Aide	Skilled Nurse Open Wound Care	Skilled Nurse Decubitus Care	Required Diapers or Chux Pads	Any Speech Therapy	Complicated Wound	Skilled Nurse Venipuncture Care	Any Occupational Therapy	Partial/Complete Bed Bath
1	2,095	536	0	<2	0	0	0						
2	59	686	0	<2	0	0	1						
3	484	1,054	0	<2	0	1		0					
4	60	1,378	0	<2	0	1		1					
5	850	907	0	<2	1				0	0	0	0	
6	38	1,848	0	<2	1				0	0	0	1	
7	244	1,400	0	<2	1				0	0	1		
8	88	1,771	0	<2	1				0	1			
9	12	2,884	0	<2	1				1				
10	118	1,734	0	>1									
11	339	1,027	1		0							0	
12	52	1,772	1		0							1	
13	299	1,806	1		1						0	0	
14	32	2,445	1		1						0	1	
15	28	1,883	1		1						1		0
16	64	2,775	1		1						1		1

NOTE: A zero (one) in a column means that the patient did not (did) receive the particular type of treatment. The figures in the columns labeled N and predicted cost are based on the entire sample of 4,862 individuals, although the tree was created using the learning sample.

13 through 16 received some form of home health aide care. Individuals in node 14 also received muscle re-education therapy, and those in nodes 15 and 16 were given skilled nurse venipuncture care.

The predicted cost estimates generally suggest that individuals who required more types of treatment were costlier than were those who required smaller amounts of care. For example, the members in terminal nodes 1, 2, 5, and 11 needed fewer types of home health services than did the other members of the sample and were the least costly to care for. By way of contrast, individuals in nodes 14 and 16 required at least three different types of services and have larger predicted costs than do the other patients.

A serious problem with the displayed CART tree is that it overpredicts low-cost individuals ($538 is the minimum predicted payment). We plan to address this problem by performing regression analyses on the 2,095 individuals in node 1. We note that the tree also underpredicts high-cost individuals. However, it is difficult to solve this problem due to the small numbers of individuals who are classified in the high cost nodes (9, 15, and 16).

C. SENSITIVITY ANALYSES

A natural question that arises is, How sensitive are the optimal trees estimated by the CART model to the various assumptions, samples, and specifications required in performing the analysis? Specifically, what sort of trees does the CART procedure generate if we were to use different random test samples of a given size, or different size test samples, or the least absolute deviation splitting rule instead of the least squares splitting rule, or transformations of the original cost variable as the dependent variable? This section describes our study of the robustness of the CART technique.

The second column of Table VIII.2 displays the input specifications for 11 CART runs. The test sample proportions are either 15, 25, or 35, and we use three different random 25 percent test samples (lettered A, B, and C). Three trees were created using the least absolute deviation (LAD) criteria for choosing the optimal split (instead of minimum sum of squared deviations), and one tree

TABLE VIII.2

GOODNESS-OF-FIT STATISTICS FOR 11 CART TREES
BASED ON THE HOLDOUT SAMPLE OF 1,233 CASES

Tree Number	Input Specifications	Number of Terminal Nodes	R = $\frac{\Sigma \hat{C}_i}{\Sigma C_i}$	RMSE = $\Sigma \frac{(C_i - \hat{C}_i)^2}{N}$	MAD = $\Sigma \frac{\lvert C_i - \hat{C}_i \rvert}{N}$	PAD = $\Sigma \frac{(\lvert C_i - \hat{C}_i \rvert / C_i)}{N}$	Mean of $C_i - \hat{C}_i$	Median of $C_i - \hat{C}_i$	R^2
	Least Squares								
	25% Test Sample								
1	Sample A:	24	.99	787	521	.99	7.6	-150	.20
2	Sample B:	30	.99	800	522	.98	6.2	-140	.17
3	Sample C:	13	.99	786	532	1.04	5.2	-181	.20
4	15% Test Sample	25	.99	794	525	1.00	12.5	-160	.19
5	35% Test Sample	10	1.00	783	531	1.05	-4.2	-193	.21
	LAD								
	25% Test Sample								
6	Sample A:	28	.81	824	507	.77	180.1	0	.12
7	Sample B:	15	.79	800	495	.75	199.4	11.8	.17
8	Sample C:	18	.81	805	503	.77	176.4	0	.16
	Least Squares								
	25% Test Sample								
	Dependent Variable = Natural Logarithm of Costs								
9	Sample A:	25	1.00	775	520	.99	1.4	-158	.22

TABLE VIII.2 (continued)

Tree Number	Input Specifications	Number of Terminal Nodes	R = $\frac{\Sigma \hat{C}_i}{\Sigma C_i}$	RMSE = $\Sigma \frac{(C_i - \hat{C}_i)^2}{N}$	MAD = $\Sigma \frac{\lvert C_i - \hat{C}_i \rvert}{N}$	PAD = $\Sigma \frac{(\lvert C_i - \hat{C}_i \rvert / C_i)}{N}$	Mean of $C_i - \hat{C}_i$	Median of $C_i - \hat{C}_i$	R^2
	Reduced Independent Variable Set:								
10	Sample A:	17	1.00	780	518	.99	-2.0	-154	.21
11	Sample B:	19	1.00	773	522	1.01	-0.6	-170	.23

was generated using the natural logarithm of the home health cost variable as the dependent variable (the LOG tree). LAD and transformed dependent variable methods were used since they potentially yield estimates that are more robust to outliers. The reduced independent variable models (trees 10 and 11) are discussed in Section D below.

In order to select a tree from the sequence of trees generated by the CART procedure for each of the eleven specifications, we plotted the sequence of test sample sum of squared errors against the number of terminal nodes. The "optimal" tree for each model was chosen to be the one whose test sample error was near the beginning of the flat valley in the respective plot (e,g., see Figure VIII.3). We did not further collapse any branches corresponding to small cells in the chosen trees since we thought that it was more accurate for our purposes here to compare the actual trees generated by the CART procedure. For example, the tree displayed in Figure VIII.2 contains sixteen nodes and is the tree from which the CART results in chapter II are based. However, this tree was constructed from a twenty-four node tree that was chosen from the sequence of trees generated by the CART program. The results in Table VIII.2 correspond to this larger tree (tree 1).

1. Comparison of Trees using the Holdout Sample

Columns 3 through 9 in Table VIII.2 display goodness-of-fit statistics for the eleven tested trees; these statistics are calculated for the holdout sample of 1,233 individuals. The R^2 values show that the CART procedure generates forecasts that explain about 20 percent of the variance in costs. The results also generally suggest that the trees yield statistics that are very similar, although some systematic differences exist across the specifications. As expected, the trees that use the LAD splitting criteria have comparatively low values for MAD and PAD, and a low value for the median of the errors, while the least squares trees perform well using the R, RMSE, and R^2 measures, and have a mean error very close to zero. The tree created using the logarithmic transformation of the cost variable performs only slightly better than does the corresponding untransformed cost model; the

two sets of statistics are almost identical. Based on the goodness-of-fit statistics, there are no systematic trends between the trees that used different test sample proportions.

Among the first nine trees, we prefer the specifications that use the least squares measure and untransformed cost variable (trees 10 and 11 will be discussed in section D.). The least squares trees are preferred to the LAD trees since the prediction of total costs is our most important model selection criterion, and the LAD trees (6 through 8) perform much worse than do the other trees based on the R statistic. The LAD trees underpredict actual costs by about 20 percent, whereas the least squares trees yield R values near unity. The LOG tree does not perform appreciably better than do the untransformed cost variable models; thus, we prefer the latter specifications for their simplicity. The results from tree 1 were used in the accuracy comparisons in Chapter II since this tree performs consistently well, relative to the other trees.

2. Comparison of Trees based on their Structures

The number of terminal nodes in the trees in Table VIII.2 ranges from 10 to 30. However, the independent variables that appear in the top branches of the trees are almost identical. The differences in the trees are primarily due to the variables that create the lower branches, where relatively small cells are being split into even finer categories. Thus, the CART procedure is robust to the choice of independent variables that appear in the initial tree splits, and these are the variables that explain most of the variation in home health costs. However, the remaining structure of the tree is sensitive to the particular test sample and/or splitting criteria that is used.

There are eight variables that consistently appear in all 11 trees, seven of which are binary variables indicating that a particular type of home health treatment was planned or received:

(1) A therapeutic exercise treatment code binary variable

(2) A home health aide treatment code binary variable

(3) A home health aide bed bath treatment code binary variable

(4) The number of hospital admissions during the home health episode

(5) A skilled nursing open wound treatment code binary variable

(6) A skilled nursing venipuncture treatment code binary variable

(7) An occupational therapy treatment code binary variable

(8) An occupational therapy muscle re-education treatment code binary variable.

In addition, the variable that represents the number of home health visits six months prior to the home health episode has significant splitting power based on a measure of variable importance supplied by CART. The variable does not consistently appear in the trees because it is being masked by other variables, but it is a leading candidate for many splits.

Examination of the groupings from the different trees shows that individuals grouped together in one tree tend to be grouped together in other trees, and that their predicted costs are fairly similar across the different specifications. Table VIII.3 displays summary statistics concerning the terminal node locations of the individuals in terminal node 2 in tree 5 (the base node for this example) and is representative of the type of results found in this analysis. The figures in column 3 refer to the terminal node in tree j that contains the largest percentage of base node cases, and this percentage and the predicted cost in that node are displayed. Columns 4 and 5 refer to those tree j nodes that contain the second and third largest base node members, respectively.

The results from Table VIII.3 suggest that the CART results are quite robust: at least eighty percent of the individuals in the base node are grouped together in the other trees, and that the high percentages exist even when there are large differences in the number of nodes in the trees. Furthermore, the base node individuals are rarely allocated to more than three groups, and the predicted costs remain somewhat constant, although the LAD trees yield lower estimates[1]. The same

[1]The correlation between the vectors of predicted costs for any pair of trees is at least .71, and almost half of the correlations are greater than .80.

TABLE VIII.3

TERMINAL NODE SUMMARY STATISTICS FOR THOSE IN TERMINAL NODE 2 IN TREE 5
(PREDICTED COSTS = $1,078, N = 533)

		Cell with Greatest Overlap		Cell with Second Greatest Overlap		Cell with Third Greatest Overlap		Remaining Cases	
Tree Number	Number of Nodes	Percent	Cost	Percent	Cost	Percent	`Cost	Percent	Cost
1	16	88.7 %	$998	10.3 %	$1,262	0.6 %	$4,543	.04 %	$6,697
2	30	82.2 %	$986	9.6 %	$1,232	7.5 %	$1,941	0.7 %	$4,160
3	13	92.5 %	$1,091	7.1 %	$1,519	0.4 %	$6,756	--	--
4	25	92.1 %	$1,057	6.5 %	$1,331	0.6 %	$3,702	0.8 %	$5,502
6	28	99.4 %	$767	.06 %	$4,897	--	--	--	--
7	15	100.0 %	$767	--	--	--	--	--	--
8	18	91.4 %	$758	8.6 %	$1,357	--	--	--	--
9	25	91.4 %	$1,004	8.6 %	$1,413	--	--	--	--
10	16	100.0 %	$1,065	--	--	--	--	--	--
11	19	83.3 %	$1,061	9.6 %	$1,293	3.4 %	$703.8	3.7 %	$2,548

pattern emerges when different base nodes are used. These results help explain why the goodness-of-fit statistics are similar for the different trees.

D. AN ALTERNATIVE ROBUST TREE

In the preceding section, we listed nine explanatory variables that are robust to the CART input specifications. Trees 10 and 11 are created using only these nine variables as input data. Table VIII.2 shows that these reduced independent variable models predict home health costs as well as does tree 1 based on the goodness-of-fit statistics. Trees 10 and 11 perform equally well, but we choose the latter tree as our "robust" tree since it contains two fewer nodes. This tree is displayed in Figure VIII.4.

The structure of the "robust" tree is similar to the structure of tree 1 (shown in Figure VIII.2) since they were both created with the same input specifications apart from the size of the independent variable set[2]. The main differences between the trees are the omission from the "robust" tree of dummy variables signifying whether the patient required diapers, whether the patient had a complicated wound, and whether the patient received any speech therapy, and the omission from tree 1 of the variable representing the number of home health visits during the six months prior to the home health episode. The interpretation of the paths leading to the terminal nodes in the two trees is similar.

E. CONCLUSION

Our results suggest that the CART model is robust to which sample cases are selected for developing or testing the CART model, the size of the test and learning samples, the fitting criteria, and the functional form. We have found only minor differences between the eleven tested trees that were produced by the CART procedure. The goodness-of-fit statistics based on the holdout sample

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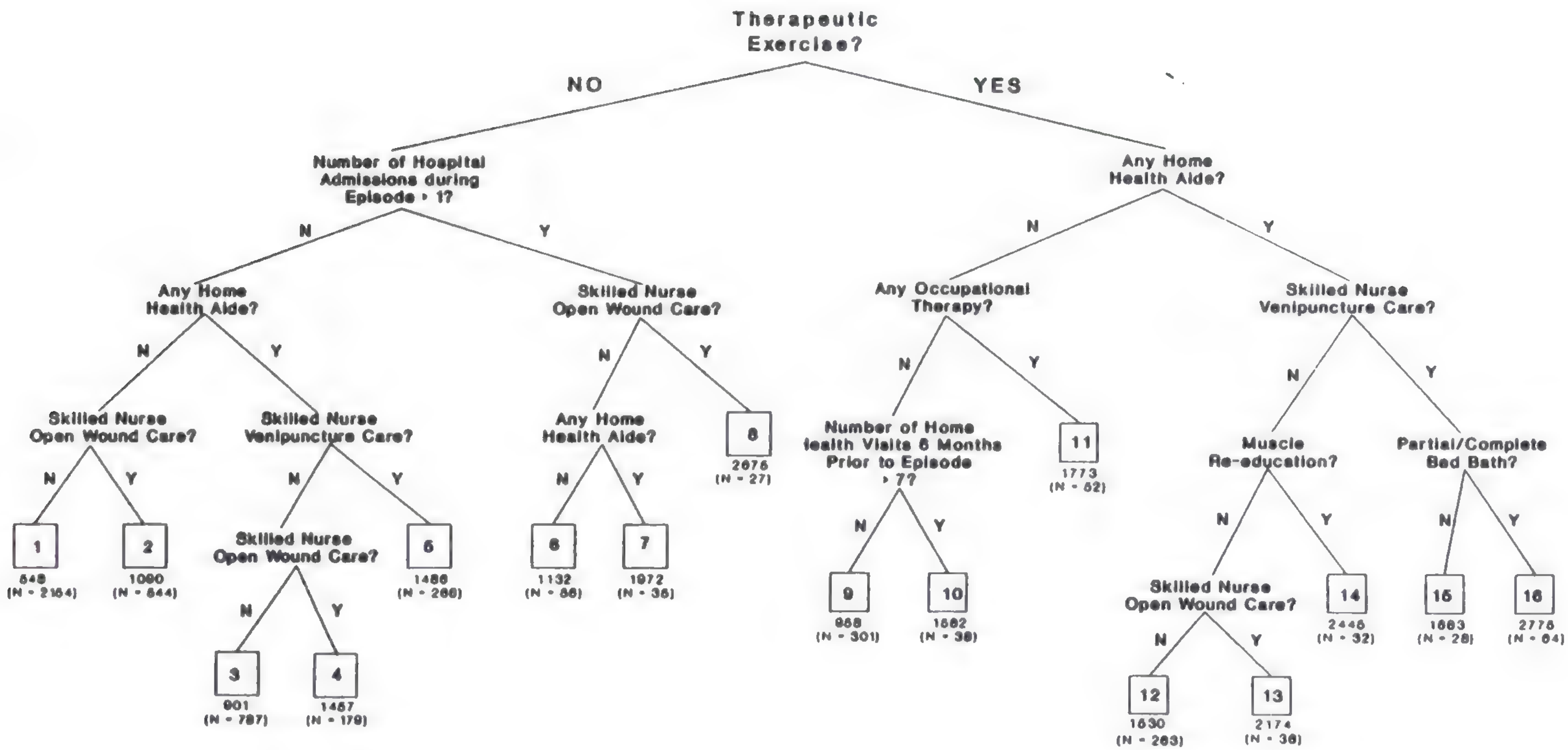
[2]The "robust" tree chosen from the sequence of trees generated by the CART procedure contained seventeen nodes. One branch was eliminated because the cell size was so small and the cost differences distinguishing this node in the learning sample did not exist in the test sample.

FIGURE VIII.4
"ROBUST" CART TREE



NOTE: Numbers are based on the entire sample of 4,862 individuals. The numbers in the boxes identify the terminal nodes. The numbers in parenthesis represent the number of cases in the terminal nodes. A number directly below a box represents the average costs for those in the nodes.

cases are generally similar, which implies that they are about equally effective in forecasting home health costs. The number of terminal nodes in the trees ranges from 10 to 30, but the top portions of all the trees are defined by the same nine independent variables. These variables, which predominantly identify treatments, explain a large share of the variance in home health costs. Furthermore, the patients grouped together in one tree tend to be grouped together in other trees. The "robust" tree , which is created using only the nine explanatory variables that consistently show splitting power in all eleven trees, does as well as other trees that use more variables. If the CART model is used to develop a case-mix adjustor for the per episode demonstration, we will pursue the robust tree approach.

IX. THE AUTOMATED GROUPING SYSTEM MODEL

The AUTOGRP procedure was included in the set of models examined because it had been used to develop the RUGS-HH case-mix index for home health care for the Medicaid program in New York (see Foley et al., 1986). The procedure, as its name implies, is a grouping procedure designed to identify groups of observations, defined by their characteristics, that are similar with respect to the value of a dependent variable. The AUTOGRP statistical procedure first examines the relationship of each individual explanatory variable to the dependent variable and suggests ways of partitioning the sample on each variable to maximize the between-group variance and to minimize the within-group variance of the dependent variable. It then evaluates the benefits of combining groups in ways suggested by the analyst. For this study, the goal was to identify characteristics on which we can partition a sample of patients in order to develop groups of patients that are similar with respect to the cost of an episode of home health care.

AUTOGRP is similar to CART in the types of groupings it seeks to create, but differs in that AUTOGRP relies on the analyst's judgment about which groups to combine and the order in which sample partitions are introduced. CART, in contrast uses purely statistical criteria (which are somewhat more sophisticated than those used by AUTOGRP) to identify optimal ways of partitioning the sample, allowing the user no opportunity to alter the order in which different partitioning criteria are introduced. It was this opportunity for the analyst to inject his/her judgment into the decision-making process that made AUTOGRP an attractive alternative to consider.

A. RESULTS

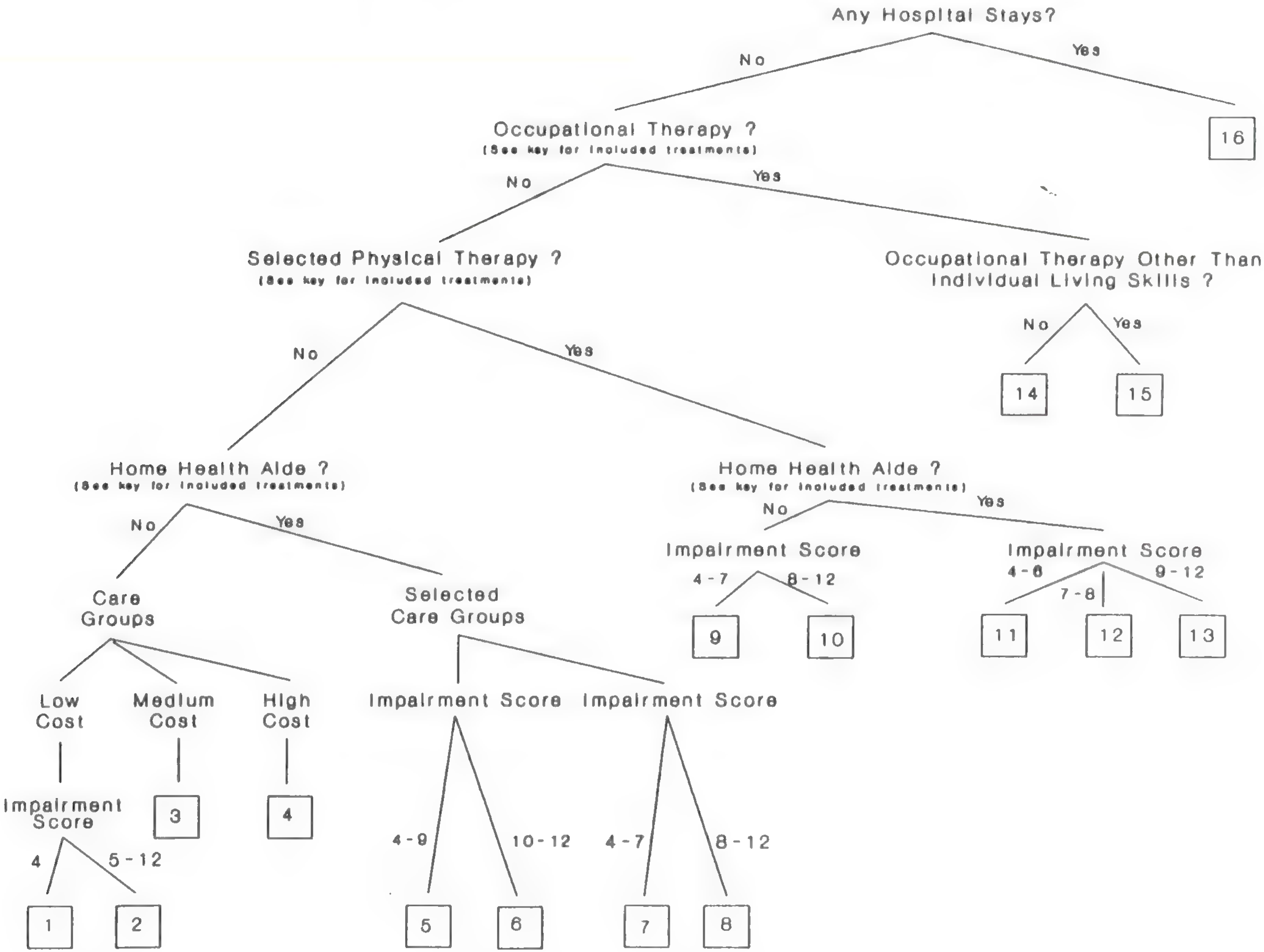
The results for the first stage of the AUTOGRP analysis indicated that the variables that explain the most variance in cost are those for certain treatments planned or received from staff other than nurses--physical therapists, aides, occupational therapists,and (to a lesser extent) speech therapists. Variables measuring the use of other health services, particularly hospital stays during the home

health episode, also explain more variance in cost than other variables. Although less powerful than the variables for treatments, a few individual care groups (which are based on primary diagnoses and procedures giving rise to need for home health care) are useful in explaining variance in cost. Wound care is the most powerful of the individual care groups. Finally, several of the measures of physical impairment, particularly at admission to home health care, are useful in explaining variation in cost.

Moving to the second stage of AUTOGRP analysis, further analysis was conducted to identify combinations of treatments, care groups, and physical impairment that were useful in explaining cost and on which to partition the sample. We identified combinations of treatments provided by three disciplines (physical therapists, occupational therapists, and home health aides) that were associated with costs, and then constructed for each patient counts, by discipline, of the number of such treatments that were planned or received. In the final classification system, the sample is partitioned into two groups depending on whether or not these counts are greater than zero. Two sets of care group combinations were identified. For patients who did **not** have any home health aide treatments, groups associated with high, medium and low cost home health care were identified. For patients with home health aide treatments, a different combination of care groups was identified. In it, some medium and high cost care groups are combined. We also identified combinations based on a physical impairment score. This score is based on impairment at admission to home health care in walking, transfer, toileting, and bathing. This score increases with the number of tasks in which the patient is impaired and the level of impairment in each.

Figure IX.1 presents the final patient classification system developed with AUTOGRP. As the figure indicates, the sample is first partitioned on whether or not the patient has a hospital stay during the home health episode, then on treatments, care group combinations, and physical impairment scores. This classification system divides all home health patients into 16 groups. The overall R^2 for this final patient classification system is 0.215.

FIGURE IX.1 AUTOGRP CLASSIFICATION SYSTEM



NOTES TO FIGURE IX.1:

Any Hospital Stays includes all hospital stays during the home health episode.

Occupational Therapy is defined as having one or more of the following types of occupational therapy treatment: individual living skills, muscle re-education, perceptual motor training, fine motor coordination, neuro-developmental treatment, sensory treatment, orthotics/splinting, and adaptive equipment.

Selected Physical Therapy is defined as having one or more of the following types of physical therapy treatments: home program, chest physiotherapy, ultrasound, electrotherapy, prosthetic training.

Home Health Aide is defined as having one or more of the following types of home health aide treatments: tub/shower, bed bath, personal care, catheter care, ambulation care, exercises, meal preparation, grocery shopping, clothes washing, house keeping, other aide care.

Impairment Score is defined as the sum of the level of a patient's dependence in walking, transfer, toileting, and bathing. For each task, total impairment receives a score of 3, partial impairment a score of 2, and independence a score of 1.

Care Groups - Low Cost includes the following lower cost diagnoses: eye and ear care, monitoring heart surgery, benign tumor/limited cancers, medication supervision, cognitively impaired, urinary incontinence, kidney disease, bowel incontinence.

Care Groups - High Cost includes the following higher cost diagnoses: knee surgery, amputation, wounds (both complicated and not).

Care Groups - Medium Cost includes all other diagnostic groups.

Selected Care Groups includes the following: anemias, antibiotics, infectious, contagions and parasitic, wound (both complicated and not), enteral feeding: gastrostomy, cognitively impaired, psychiatric monitoring, fracture/paralysis:lower limb, medication supervision, diabetic care, amputation.

AUTOGRP was fairly difficult to apply to this problem because of the number and nature of the variables. A very high percentage of our variables were binary, whereas AUTOGRP performs better with continuous variables or those with many possible values. Also, the sheer number of variables made it difficult to select groups to combine from the somewhat bewildering array of choices. In fact, the decisions about which partitions to examine further were guided to some extent by our early findings from the CART model.

B. PERFORMANCE ON HOLDOUT SAMPLE

AUTOGRP, like the CART, regression and GoM models, did quite well on predicting the average cost for the holdout sample, but was slightly worse than these other models on the other measures of accuracy. The root mean squared error, mean absolute deviation, and mean percentage deviation range from 3 to 8 percent higher than those for CART, the model most similar in form to AUTOGRP. The R^2 for the holdout sample is about 0.18.

Because AUTOGRP seems to be dominated by CART and is much more cumbersome to use, we dropped AUTOGRP from further consideration. In this instance, adding an experienced analyst's insights did not lead to a better predictions of costs than those generated by purely statistical criteria.

X. THE GRADE OF MEMBERSHIP MODEL

An alternative procedure that we have examined in developing a case-mix adjustor is the Grade of Membership (GoM) technique, a grouping procedure somewhat akin to factor analysis. Unlike CART, and other grouping procedures, the GoM predicts the degree to which each individual resembles the different categories of patients, rather than slotting them into a single classification cell. Thus, patients are not assigned a cell mean as their predicted value, but rather a weighted average. Also, the categories are not defined concretely, as they are in the CART model, but rather are identified by the set of characteristics that tend to coincide in clusters of sample members.

GoM resembles CART in one sense, however, and differs substantially from regression models in that it identifies complex interactions of characteristics. We then used these combinations of characteristics to predict costs. The difference between GoM and regression in our application here is that all of the variables originally used in the basic regression model have been first condensed into a small number (e.g., 10) of "pure" patient types, highly nonlinear combinations of characteristics, before using them to predict costs.

A. USING THE GoM PROCEDURE TO PREDICT COSTS

GoM does not discriminate between dependent and independent variables. The underlying model is as follows:

$$(6) \quad X_{ikl} = \sum_{j=1}^{J} g_{ij} \lambda_{jkl},$$

where X_{ikl} is the lth level of the kth variable (characteristic), all of which are assumed to be categorical, for the ith patient. The g's and λ's are the parameters to be estimated; λ_{jkl} is the effect of being a "pure" type j on the probability that variable k assumes the lth value, and g_{ij} is (essentially)

the probability that patient i is a pure type j. All λ_{jkl}'s and g_{ij}'s are constrained to be between 0 and 1 (inclusive), since they are probabilities.

When the GoM model is estimated, the minimum number of pure types J required to fit the observed data is determined empirically (i.e., J is set at the value beyond which the improvement in the fit to the data would be statistically insignificant). The λ coefficients indicate the types of patients who comprise each of the pure types, because certain characteristics will be shown to be strongly related to a particular pure type but not others.

The GoM procedure was used by Manton and Hausner (1987) to predict home health costs, but the ability of the model to predict home health costs was overstated in that study. Cost was used to estimate the g's and λ's, and then cost was regressed on the estimated g's and other characteristics for the same sample. The percent of variance explained in this study (R^2 = .45) clearly overstates the expected power of the model to predict cost in an independent sample.

We have used GoM in the following way to obtain predicted values of costs for the holdout sample:

(1) Estimate the GoM model on the same estimation sample used for the other models, including in the model various patient characteristics, as well as measures of resource use or cost. Obtain parameters λ's and g's.

(2) Regress the standardized cost measure for the same demonstration cases as used in (1) on the estimated g's, which represent each patient's set of probabilities of belonging to the various pure types.

(3) Use the estimated λ's, together with the data on each patient's characteristics in the **holdout** sample to solve for each patient's set of g's. For example, if there were 3 pure types and k characteristics (X's), we would solve for the values of g_{i1}, g_{i2}, g_{i3}, that best fit the following system of equations, for each individual i:

$$X_{i1} = g_{i1}\lambda_{11} + g_{i2}\lambda_{21} + g_{i3}\lambda_{31}$$

$$X_{i2} = g_{i1}\lambda_{12} + g_{i2}\lambda_{22} + g_{i3}\lambda_{32}$$

$$X_{i3} = g_{i1}\lambda_{13} + g_{i2}\lambda_{23} + g_{i3}\lambda_{33}$$

$$X_{ik} = g_{i1}\lambda_{1k} + g_{i2}\lambda_{2k} + g_{i3}\lambda_{3k}$$

where X_{ij} is the value of the jth (binary) variable, say, for the ith person, λ_{1j} is the probability that a pure type 1 case has a value of 1 for the jth variable (λ_{2j} and λ_{3j} are analogous probabilities for the second and third pure types), and g_{i1}, g_{i2}, g_{i3} are the probabilities that individual i is pure type 1, 2, and 3, respectively. Note that the system must be solved for each sample member for the g's. Most importantly, note that while costs and perhaps resource-use measures were used in the GoM model on the estimation sample to determine the λ's and g's, they are not used to solve for the g's in the test sample. Only characteristics that were used to predict costs in the other models were used to solve for the g_{ik}'s.

(4) Compute for each member of the test sample their predicted value of cost, by inserting their values of g's from step (3) and other characteristics (Z's) into the estimated cost equation from step (2).

B. RESULTS FROM THE GoM MODEL

The GoM model with the best fit from the various specifications tried was one using 171 variables, including two cost variables--cost for the first 60 days and costs for the full 120 days. This model performed much better on the holdout sample than did the GoM model which did not include cost measures in deriving the λ's (12 percent lower or both root mean squared error and mean absolute deviation). The model had 10 pure types.

The pure types differed substantially on cost. The cost variables, like all variables in the GoM model, were each converted into a series of binary variables. Eleven cost categories were created, ranging from under $200 to over $3,000. The λ coefficients for the cost categories indicate that three of the 10 pure types were obviously low cost groups (cost less than $750), 2 are high cost groups (over $2,000), and 3 are moderate cost groups ($500 to $2,000). The other two pure types include individuals with a wide range of cost values. These two pure types are apparently identified with characteristics other than the cost of the episode.

The three low-cost pure types are all comprised of females but are otherwise quite diverse. One type is very unimpaired on ADL tasks, but living alone, one type is very impaired functionally, and one type is somewhat between these extremes on functioning but includes individuals with heart problems. The two high cost groups are both associated with males. One of these high cost groups is quite impaired mentally and physically, and has difficulty communicating. The other high cost

group is recovering from a serious injury or cancer, is likely to have had one or more hospital admissions during the episode, and has diabetes as a comorbidity.

Once the model was estimated, we regressed costs on the g_{ik}'s in the estimation sample to get the cost weights for the 10 pure types. We then used the procedure described in section B above to solve for the g_{ik}'s in the holdout sample, the probabilities that each individual was each of the pure types. In solving for the g_{ik}'s, we used all of the variables used to estimate the GoM model except costs. Once these estimates were obtained, we inserted the predicted g_{ik}'s into the cost model to predict costs for the holdout sample.

The cost regression yields a set of predicted costs (cost weights) for the pure types that reliably reflects the λ coefficients on the cost variables in the GoM model, as expected. That is, the three pure types with λ's indicating that the type is comprised mainly of low-cost patients had the three lowest regression coefficients, and the two high-cost pure types from the GoM model had the highest regression coefficients. The results, displayed in Table X.1, show that the predicted costs for the pure types range from a maximum of $7,288 to a low of -$360. The two negative weights are not necessarily a cause for concern, because the predicted costs for any individual are a weighted average of the ten coefficients. The estimated cost factors were all highly significant (t-statistics ranged from 3 to 33), and the cost regression explains 28 percent of the variance in costs in the estimation sample.[1]

The predicted g_{ik}'s for the holdout sample varied widely, ranging from 0 to .80 or larger for four of the pure types, and from 0 to about .45 for the other 6 pure types. The sample means for the g_{ik}'s, that is, the mean predicted probabilities of being pure types 1 through 10, are the average weights applied to the cost factors in the holdout sample. (See Table X.1, column 2). The average g_{ik}'s for the three low cost pure types are three of the four highest, and total 55. Thus, the low-cost

[1]Recall, however, that this regression is estimated on g_{ik}'s that are partially determined by the value of costs.

TABLE X.1

PREDICTED COSTS BY PURE TYPE AND AVERAGE PROBABILITY FOR THE GRADE OF MEMBERSHIP MODEL

Pure Type	Predicted Cost (Cost Weights)[a]	Mean Probability[b]
1	7,228	.042
2	3,564	.053
3	2,069	.075
4	1,802	.042
5	1,574	.054
6	1,400	.119
7	646	.060
8	130	.109
9	-168	.274
10	-360	.171

[a]Cost weights are the regression coefficients obtained from the analysis sample by regressing cost on predicted g_{ik}'s. The sample size for this regression was 4,624. The R^2 was .28.

[b]The mean probability for the k^{th} pure type is the average predicted value of the g_{ik}'s for the holdout sample. Thus, this is the average value of the weight applied to the cost factor for this pure type in calculating predicted costs.

cells receive over half the weight in computing predicted costs. Conversely, the mean weight for each of the 5 pure types with the highest cost is less than .075.

C. COMPARISON TO OTHER MODELS

The best GoM model yielded an average predicted cost for the holdout sample that was very similar to the average actual cost, but did not perform quite as well as regression on the other measures. For each of the statistics considered, the GoM model was somewhat (2 to 12 percent) worse. The tails of the error distribution were also fatter for the GoM model. The 20th percentile of the errors was $64 larger (in absolute value) for the GoM model.

In considering GoM as a possible model for developing a case-mix adjustor, our position has always been that, given its greater complexity, it should only be considered if it performed substantially better than other methods. Since GoM actually yields somewhat worse predictions than the simple regression model, it does not warrant further consideration for use in developing an adjustor. However, we have not examined the GoM results thoroughly to determine whether some of the groupings of variables present in the pure types should be used to define subgroups of patients that could be distinguished in a regression model. We intend to do so before conducting further analyses.

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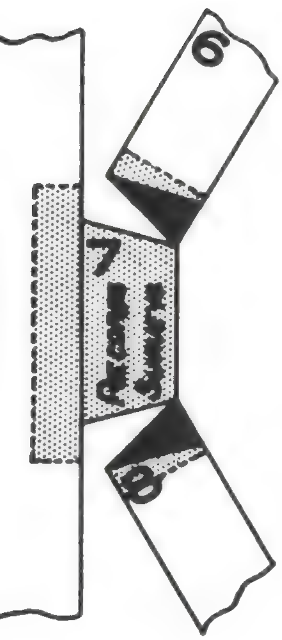

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EVALUATION OF THE HOME HEALTH PROSPECTIVE PAYMENT DEMONSTRATION

SUMMARY OF THE CLINICAL PANEL MEETING ON HOME HEALTH TREATMENTS

July 1992

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EXECUTIVE SUMMARY AND RECOMMENDATIONS

Medicare expenditures for home health care have risen rapidly in recent years. The Health Care Financing Administration (HCFA) estimates that Medicare home health spending will increase to $4.1 billion in fiscal year 1992, a 10 percent increase over the fiscal 1991 level, and a 64 percent increase over the fiscal 1989 level. Responding to the grc .th in Medicare expenditures in general and to the dramatic growth in home health care expenditures in particular, HCFA is assessing alternatives to the present system of cost-reimbursement for Medicare home health care services--a payment system that does not offer incentives for providing home health care efficiently. An alternative currently under consideration would introduce prospective payment on a per-episode basis. A demonstration to assess the per-episode payment methodology is planned for implementation in 1993. However, its implementation requires developing a case-mix adjustor for payment which ensures fair compensation for agencies that serve patients whose level of need is above or below average.

Mathematica Policy Research, Inc. (MPR) currently has a contract with HCFA to evaluate a demonstration of per-visit prospective payment and to design a case-mix adjustor for the per-episode demonstration. This report summarizes the suggestions of a clinical panel convened in May 1992 as one part of the task to develop a case-mix adjustor. The mission of the panel was to identify the characteristics of patients associated with a group of home health treatments that MPR found were associated with higher-than-average episode costs:

- ***Skilled nursing treatments*** (from the HCFA 485/486): bladder instillation, wound care/ dressing, decubitus care stage 3 to 5, decubitus care stage 1 to 2, venipuncture, the administration of vitamin B12, the administration of an injection other than vitamin B12 or insulin, teaching gastrostomy feeding, and teaching diabetic care

- ***Skilled nursing interventions*** (from codes developed by the Georgetown University School of Nursing): cardiopulmonary conditioning, infusion care, respiratory care, and the monitoring of vital signs

- *Physical therapy treatments* (from the HCFA 485/486): any physical therapy treatment, and therapeutic exercise

- *Occupational therapy treatments* (from the HCFA 485/486): any occupational therapy treatment, and muscle re-education

- *Speech therapy treatments* (from the HCFA 485/486): any speech therapy, speech therapy evaluation only, and treatment for a speech articulation disorder

- *Medical social services treatments* (from the HCFA 485/486): any medical social services treatment, and short-term therapy

- *Home health aide treatments* (from the HCFA 485/486): any home health aide treatment, partial/complete bedbath, and assistance with exercise

In preparation for the meeting, MPR sent panel members the results of regressions of these home health treatments on patient characteristics, derived from a database constructed for the Georgetown University School of Nursing Home Health Care Classification Project combined with Medicare claims data. During the panel meeting, discussion of the types of patients who receive each treatment began with a question about whether the empirical findings based on the Georgetown data made clinical sense (since a small number of the empirical associations were likely to have been observed by chance). In general, the panel found the empirical findings reasonable.

The panel recommended numerous characteristics of patients and their informal caregivers beyond those suggested by the Georgetown data. We grouped their suggestions into the following five categories:

- *Medical Conditions*. The HCFA-485 form collects ICD-9 codes that describe the patient's primary diagnosis and principal surgical procedure for home health admission, as well as secondary diagnoses that may affect home health care. Rather than considering each diagnosis as a separate predictor of treatments or costs, we currently group diagnoses and procedures according to the type and amount of home care typically associated with their presence. The panel suggested disaggregating several diagnoses embedded in the current groupings (including, for example, laryngectomy and osteoporosis.) The panel further suggested that some relevant medical conditions may not appear on the HCFA-485 as primary or secondary diagnoses (including ataxic gait and the presence of pain).

- *Orders for Medications*. Elderly home health patients often take several medications that affect whether and the extent to which they receive home health treatments, as does their method of administration. For example, patients who receive anti-coagulants frequently require venipuncture, while patients who receive insulin often receive diabetic teaching. In addition, the administration of a medication by injection is less time-consuming than intravenous administration, and patients who receive intravenous medication through central venous catheters are likely to require more care than patients with peripheral intravenous lines.

- *Other Physical and Financial Conditions*. Many physical conditions beyond medical diagnoses and the presence of orders for medications affect the receipt of home health treatments. These include recent changes in ADL and IADL ability, an increased incidence of falling, the severity and location of wounds, nutritional status, and the use of adaptive and assistive equipment--all of which may affect therapy, nursing, and aide treatments. Financial management difficulties, limited funds, and the need to make conservatorship or guardianship arrangements may cue medical social work treatment.

- *Emotional and Cognitive Conditions*. Emotional and cognitive conditions often affect the length of treatment, particularly if the treatment entails learning an exercise or some type of self-care. The learning process becomes longer if a patient is depressed or cognitively impaired. However, if the patient is too depressed or cognitively impaired, treatment is likely to take the form of instruction to the informal caregiver. In such cases, the duration of treatment becomes much shorter. The following emotional and cognitive conditions are likely to affect the receipt of treatment: compliance and cooperativeness with a care plan or program of treatment; depression; grief over a recent loss; disorientation and confusion; and comprehension of and ability to follow instructions.

- *Characteristics of Informal Caregivers*. The availability and ability of informal caregivers have a major affect on the level of treatment required by a patient from home health agency staff. A willing and able caregiver can be trained to assist with a program of therapy, to perform some skilled nursing tasks (such as changing dressings on wounds or injecting insulin), and to provide personal care. Thus, several measures are important: whether an informal caregiver is available for the patient, the level of his or her willingness and ability to learn to provide the necessary care, and whether the informal caregiver is approaching burnout.

All of these suggested patient and informal caregiver characteristics have the potential to improve the prediction of home health treatment receipt, and thus may improve the accuracy of a case-mix adjustor for an episode-based prospective payment system for Medicare home health care. Data on primary and secondary medical diagnoses are already collected on the HCFA-485 form, and suggestions to disaggregate certain medical conditions from existing diagnostic groupings do not call

for new data collection efforts. Several suggested characteristics (such as measures of the availability and ability of informal caregivers and measures of compliance history) are being collected for the current prospective payment demonstration on the Patient Intake Data Form and in the Patient Survey, and their efficacy at predicting home health episode costs will be tested.[1] However, even the remaining list of suggested characteristics is lengthy, and collecting data for all these characteristics would clearly not be practical for an on-going payment system. The list of suggested characteristics must be winnowed prior to testing the efficacy of these characteristics at predicting home health costs. For example, narrowing the list of characteristics for which data may be collected may require prioritizing the characteristics according to the importance of their associated home health treatments in the final case-mix analysis for the per-episode prospective payment demonstration.[2]

The panel raised several important issues related to developing a prospective payment system for Medicare home health care that were not related specifically to predicting the receipt of individual home health treatments or the level of treatments:

- Due to a shortage of physical, occupational, and speech therapists working with Medicare home health patients, some groups of patients--particularly patients in inner cities and rural areas--may not currently have sufficient access to therapies during a home health episode. The lack of representation of such patients in currently available databases may exacerbate the access problem in a future prospective payment system whose case-mix adjustor is based on the existing data.

- Due also to the shortage of therapists for Medicare home health patients, a certain degree of substitution of care exists under which, for example, a nurse may provide limited physical therapy or a physical therapist may provide limited occupational therapy.

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[1]Appendix Tables C.1 through C.5 contain draft lists of questions that could be used to collect the measures suggested by the panel. These lists, which also appear in Appendix B, have been annotated to indicate which measures are currently being collected on the Patient Intake Data form and the Patient Survey for the per-visit demonstration. In many cases the measures currently being collected are variants of the measures suggested by the panel.

[2]Another approach to prioritizing the list of characteristics would be to select the measures associated with the most gameable types of treatments, for example, physical therapy and home health aide services. Appendix Table C.6 presents draft questions for measures associated with the receipt of physical therapy and home health aide services.

Currently, the average costs of nurses, physical therapists, and occupational therapists are roughly equal, and substitution reportedly occurs only when very limited care is required. However, a change in the relative costs of care in the future could create incentives to use the less expensive profession more widely, potentially to the detriment of patients.

- Home health aides, while providing services that are vitally required by many patients, tend to foster unnecessary dependency in some home health patients that may ultimately increase their future use of home health and other services. The panel recommended that any patient for whom a home health aide is ordered should first be assessed by a physical or occupational therapist for potential rehabilitation to a more independent state. The panel strongly recommended that it the patient be assessed as early in the episode as possible, preferably before the first aide visit, since a single aide visit may create an environment that promotes dependency among homebound elderly patients.

- Medicare home health treatments, although necessary for processing claims, may inadequately characterize the nature of care required by some patients. For example, the treatment code for venipuncture may be the only skilled treatment coded for very debilitated patients with weak informal care systems who need frequent personal care from home health aides but relatively infrequent nursing visits to draw blood to monitor medications. The cost of an episode of care for such a patient would be substantial. However, since the provision of venipuncture itself is relatively inexpensive, having a relatively large payment associated with venipuncture seems counter-intuitive. A case-mix adjustor based on a range of patient characteristics would provide a more straightforward, intuitively appealing payment scheme.

- Finally, the home health industry has been and continues to be in a state of flux. The causes are numerous. Medicare home health regulations were revised in 1989 to allow Medicare home health agencies to serve patients with chronic illnesses. Practice patterns are changing in response to changes in home care technology. And future changes in other parts of the health care system (for example, changes to the Medicare DRG system or to nursing home reimbursement) would affect home health. Since a case-mix adjustor is inevitably based on a point-in-time snapshot of home care, the panel recommended that a method be developed to respond to future changes that affect the Medicare home health system.

I. BACKGROUND

Medicare expenditures for home health care have risen rapidly in recent years. The Health Care Financing Administration (HCFA) estimates that Medicare home health spending will increase to $4.1 billion in fiscal year 1992, a 10 percent increase over the fiscal 1991 level, and a 64 percent increase over the fiscal 1989 level. Responding to the growth in Medicare expenditures in general and to the dramatic growth in home health care expenditures in particular, HCFA is assessing alternatives to the present system of cost reimbursement for Medicare home health care services--a payment system that does not create incentives for providing home health care efficiently.

An alternative reimbursement approach in which prospective payment for home health services is made on a per-visit basis is currently being tested. In October 1990, HCFA began implementing a demonstration of the per-visit payment methodology among 49 home health agencies in 5 states (California, Florida, Illinois, Massachusetts, and Texas). Under the demonstration, agencies receive a fixed payment rate, set in advance, for each of the six basic types of home health care visits, rather than the traditional retrospective reimbursement of costs.

Another approach would introduce prospective payment on a per-episode basis. A demonstration to assess the per-episode payment methodology is planned for implementation in 1993. However, its implementation requires developing a case-mix adjustor for payment which ensures fair compensation for agencies that serve patients whose levels of need are above or below average.

Mathematica Policy Research, Inc. (MPR) currently has a contract with HCFA to evaluate the per-visit demonstration and to design a case-mix adjustor for the per-episode demonstration.

As part of the task to develop a case-mix adjustor, this report summarizes the suggestions of a clinical panel convened in May 1992 to identify the characteristics of patients that are associated with a set of home health treatments whose episode costs are, according to an analysis by MPR, higher than average. In the remainder of this chapter, we present background information on developing

case-mix adjustors for home care and a brief summary of the MPR case-mix analysis to date, which served as a backdrop for the panel discussion. Chapter II summarizes the suggestions of the clinical panel. Chapter III presents other important points raised by the panel that have implications for future work on developing a prospective payment system for Medicare home health services.[1]

A. CRITERIA FOR DEVELOPING CASE-MIX PAYMENT ADJUSTORS

A case-mix adjustment system should meet several criteria. The system must adequately explain home health resource use. This task is difficult, because the determinants of home health resource use are complex. The system must be *fair*: different providers must be paid comparable amounts for comparable care. The system should be *neutral*: it should neither reward nor penalize an agency for performing a particular service. The system should be *clinically meaningful*: it should group patients whose clinical management is similar. A system which is clinically meaningful is likely to retain its explanatory power as clinical practices and technology evolve. The system must be *easy to use* and *rely on data whose acquisition is not too expensive*. And, finally, the system should *not offer agencies inappropriate incentives* that could adversely affect the quality of and access to care, or that could give agencies an opportunity to manipulate the adjustor to enhance revenue *without* improving the care delivered to patients.

In practice, all of these criteria cannot be met simultaneously. For example, the ability to explain resource use accurately must be weighed against the cost of collecting very detailed data on patients and against the cost of having the adjustor include some measures that can be collected relatively inexpensively, but which can be manipulated by agencies to increase revenue without benefiting the patient.

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[1]The report also contains two appendices: Appendix A includes reference materials, such as the diagnostic groupings used in the case-mix analysis, the Patient Intake Data Form for collecting supplementary patient information for the per-visit prospective payment demonstration, and lists of Medicare home health treatment codes and nursing interventions. Appendix B includes drafts of questions developed on the basis of the additional patient characteristics suggested by the clinical panel.

B. REVIEW OF THE CASE-MIX LITERATURE

Although much effort has been devoted to identifying the determinants of hospital resource use, researchers and clinicians have focused only recently on the problem of identifying groups of patients with similar levels of home health resource use, and only a few studies have focused on the Medicare population specifically. Some studies have been based on data only on patient characteristics, such as medical conditions and functioning, while others have been based on data on home health treatments.

Some home health case-mix studies have their roots in a study by Fries and Cooney (1985) to develop a patient classification system for nursing-home care. Their system, called Resource Utilization Groups (RUGs), classified nursing-home patients into one of nine groups based solely on limitations in performing three Activities of Daily Living (ADLs)--dressing, ambulation, and eating--and on the need for fluid intake and output monitoring. These categories were later augmented to account for whether a patient was in a nursing home for cognitive or physical disabilities, and whether the disabilities were believed to be temporary or permanent.

The Resource Utilization Groups for Home Health Care (RUG-HHC) system was developed for patients who receive different types of community-based long-term care, including Medicare home health services (Foley, Schneider, Dowling, et al., 1986). RUG-HHC classified patients into the following categories:

- Patients who need two or more hours per week of physical, occupational, and/or speech therapy
- Patients who need special nursing care (such as care for stage 4 decubiti, dialysis, suctioning, daily intravenous injections, nasogastric feeding, or catheter insertion and care)
- Patients with mental impairment or behavioral problems; patients with complex management problems (such as dehydration, terminal illness, or stage 3 decubiti)
- Patients with physical impairments and skilled nursing needs
- Patients whose community living skills are impaired

Within each of the categories, patients are further differentiated by their levels of ADL or IADL impairment.

Manton and Hausner (1987) developed a classification system based on data on Medicare-covered patients from the 1982 National Long-term Care Survey. They identified six categories of patients whose Medicare home health resource use was relatively homogenous:

- Patients with limited acute medical problems and little functional disability
- Patients with musculoskeletal problems and serious limitations in mobility, such as hip and other types of fractures and severe arthritis
- Patients with cancer and other serious acute medical problems
- Patients with multiple chronic health problems and serious limitations in performing Instrumental Activities of Daily Living (IADLs)
- Patients with acute and chronic circulatory and respiratory problems, such as diabetes and hypertension
- Patients with neurological impairment and a wide range of functional limitations, such as dementia and stroke

Using Foley's work as a stepping-off point, Abt Associates (1990) developed a preliminary case-mix adjustor for the per-episode demonstration as part of its design of the Home Health Prospective Payment Demonstration. The Abt adjustor was developed with HCFA 485/486 data for 4,000 Medicare beneficiaries who received home health care in the middle to late 1980s. Patients were classified according to similar levels of home health charges for episodes of care that were 120 days or less. Diagnosis and type of care (that is, rehabilitation; special nursing services, such as IV therapy and complicated wound care; and other skilled nursing care) were used to classify patients. Measures of ADLs and IADLs were not incorporated, since extensive measures of these patient characteristics were not available.

Saba (1991) of Georgetown University School of Nursing investigated the type of variables most useful for explaining home health resource use, particularly nursing. Data for the project were

abstracted from agency medical records for nearly 9,000 patients from 400 agencies in 1988 and 1989, yielding much more detailed patient data than were available from the Abt study. Saba considered the following types of variables: functional status, nursing diagnoses, nursing intervention (including but not limited to the nursing treatments covered by the HCFA 485/486 codes), primary medical diagnosis and surgical procedure, and selected demographics.[2] She found that the most powerful predictors were nursing interventions and nursing diagnoses.

Finally, Smith, Baker, Branch, et al. (1992), in a study of veterans who were receiving home health care, developed an alternative to cost reimbursement for home health care in the Veteran's Administration system. Their study examined over 200 patient and caregiver characteristics and measures of health care utilization and home health costs. They found the following explanatory measures for home health resource use: diagnoses at admission, the number of service types required at admission, and the number of subsequent home health episodes. The authors suggest that "the number of service types required" measure service complexity, and that "the number of subsequent home health episodes" measure patient instability. While both measures were strongly associated with home health resource use, neither is desirable for developing a case-mix adjustor, since the "number of service types required" can be manipulated easily, and the "number of subsequent episodes" is not available until some time after the episode is complete. The authors point out that the subjective judgments of staff about whether patients required care were in fact the strongest predictors of resource use. However, this information was discarded because it can be manipulated by the agency.

The home health patient classification studies to date indicate that, when available, measures of care received or planned (the type of care, nursing intervention, and service required) dominate other variables in explaining home health resource use.

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[2]The Georgetown nursing interventions, which were based on a retrospective review of patient records, are listed in Appendix A. MPR used the Georgetown study data for the first phase of the case-mix analysis for the evaluation of the Home Health Prospective Payment demonstration.

C. THE HOME HEALTH PROSPECTIVE PAYMENT CASE-MIX ANALYSIS

The case-mix analysis being conducted by MPR for the Home Health Prospective Payment demonstration has two important objectives: (1) to develop a case-mix adjustor for the forthcoming per-episode prospective payment demonstration; and (2) to learn more about the factors that generally determine a patient's use of home health care. These objectives are obviously linked; a knowledge of the determinants of home health care is necessary for developing an adequate case-mix adjustor. However, the objectives differ in that some variables that may be good predictors of resource use may be unsuitable for determining payment levels, due to practical or political factors or difficulties in obtaining the data in an ongoing program.

MPR is using a two-stage approach to developing the case-mix adjustor for the per-episode demonstration. In the first stage, we have used the dataset collected by Saba in the Georgetown University School of Nursing Home Health Care Classification Project (described in Section B) to explore the factors that determine home health use and to compare case-mix adjustors based on different analytic techniques. For this analysis, we merged the Georgetown data with HCFA data on the use of other Medicare services from the Medicare Automated Data Retrieval System (MADRS). Although the content of the merged Georgetown/MADRS data differs to some degree from the content of the data that will be available during the per-episode demonstration, the Georgetown data were available at the start of the analysis. The second stage of the analysis will rely largely on data collected in the initial months of the per-visit demonstration and will be guided by the results obtained with the Georgetown data.[3]

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[3]In particular, the per-visit demonstration is using an intake form that will collect more detailed patient data than are contained on the HCFA 485/486 forms. Appendix A provides a copy of the Patient Intake Data Form for the demonstration.

1. Defining Episode and Resource Use

For the main body of analyses based on the Georgetown data, we defined an episode of Medicare home health care as a series of claims for Medicare home health visits preceded and followed by 30-day periods in which no Medicare home health claims appeared on MADRS. We did not examine care received beyond the first 120 days of an episode, because the per-episode payment is expected to apply only to the first 120 days of care (care received after 120 days is to be paid for on a per-visit basis). The dependent variable for the analysis based on the Georgetown data was a standardized measure of the cost of Medicare home health resources received through the end of the episode or in the first 120 days of the episode, whichever was shorter. We constructed the standardized measure of cost by determining the number of each of the six types of Medicare visits received by a patient during the period of interest (skilled nurse, physical/occupational and speech therapist, medical social worker, and home health aide), weighing the number of visits by a standard set of costs per visit, and summing the visits weighted by costs to obtain a total cost.[4]

2. Explanatory Variables

We constructed the following explanatory variables from the merged Georgetown/MADRS database:

- Care received or planned
  - Treatments (derived from the coding system on the HCFA form 485/486)
  - Nursing interventions (derived from the coding system developed at Georgetown University)
- Medical condition
  - Diagnosis/procedure group (derived from the categories of primary diagnoses and surgical procedures on the 485 form, which classified the conditions associated with similar types and levels of required home health care)

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[4]We chose a standardized measure of cost, rather than charges, because charges would have incorporated differences in efficiency across agencies that are unrelated to the care received by patients.

- Comorbidity (based on secondary diagnoses related to home health care)
- Severity of illness (proxied by the use of health services)

- Functioning
  - Ability to perform activities of daily living (at admission to home health care)
  - Sensory, cognitive, and other limitations
  - Equipment and supply use
- Prognosis at admission
- Informal caregiving (for example, whether the patient had a visiting informal caregiver)
- Response to care
  - Change in functional status
  - Resolution of problems
- Truncation of episode (home health episode ended by a nursing-home admission or death)
- Demographic characteristics[5]

3. Overview of the Analysis Plan

The Georgetown dataset contains detailed data on home health resources used, including information on the number of each of the six types of visits covered by Medicare, the dates of these visits, the characteristics of patients at admission and at discharge, and treatments planned or received during the home health episode.

The merged Georgetown/MADRS database contains over 6,000 episodes of home health care. A random sample of approximately 1,200 episodes was selected as a "holdout" sample for testing the predictive accuracy of alternative case-mix adjustors. The other 4,800 episodes (the "estimation sample") were used to develop the adjustors.

[5]Appendix A provides full lists of diagnostic/procedure groups, comorbidities, Medicare treatments, and Georgetown nursing interventions.

Multiple analytic techniques were used to estimate the relationship between patient characteristics and home health resource costs (in the estimation sample), and then to predict costs for the holdout sample. These techniques involve two basic methodological approaches: classification and multiple regression. Classification techniques divide patients into mutually exclusive and exhaustive groups based on variables that are determinants of home health resource use. Patients grouped together have similar levels of resource use, while those in different groups have different levels. Multiple regression techniques assign a score to each patient based on variables that are determinants of resource use. Each determinant carries a different weight--some positive, some negative. Weights are then summed to obtain an overall score for each patient.

D. THE OBJECTIVES OF THE PANEL MEETING

The results of the first stage of the analysis to develop the per-episode case-mix adjustor based on observations from the Georgetown/MADRS database indicated that measures of the care received or planned for patients were much better predictors of home health episode costs than were other measures of patient characteristics. (The Georgetown data did not distinguish between care planned and care received.) The following care measures were statistically significant predictors of cost in the most accurate adjustor developed in the case-mix analysis:

- *Skilled nursing treatments* (from the HCFA 485/486): bladder instillation, wound care/ dressing, decubitus care stages 3 to 5, decubitus care stages 1 to 2, venipuncture, the administration of vitamin B12, the administration of an injection other than vitamin B12 or insulin, teaching gastrostomy feeding, and teaching diabetic care

- *Skilled nursing interventions* (from the Georgetown codes): cardiopulmonary conditioning, infusion care, respiratory care, and the monitoring of vital signs

- *Physical therapy treatments* (from the HCFA 485/486): any physical therapy treatment, and therapeutic exercise

- *Occupational therapy treatments* (from the HCFA 485/486): any occupational therapy treatment, and muscle re-education

- *Speech therapy treatments* (from the HCFA 485/486): any speech therapy, speech therapy evaluation only, and treatment for a speech articulation disorder

- *Medical social services treatments* (from the HCFA 485/486): any medical social services treatment, and short-term therapy

- *Home health aide treatments* (from the HCFA 485/486): any home health aide treatment, partial/complete bedbath, and assistance with exercise

Other patient characteristics that predicted home health episode cost based on the Georgetown/ MADRS data included several primary and secondary diagnoses and surgical procedures noted at admission to home health, the use of certain supplies or equipment, some physical limitations, and proxy measures for the clinical stability of the patient. (Appendix A provides a table of the parameter estimates of regression models of episode costs on patient characteristics.) The Georgetown data were inadequate for describing the availability and ability of informal caregivers, the emotional and cognitive state of the patient and caregiver, and physical changes in the patient that may have initiated the home health episode or specific home health services.

Table I.1 describes the percentage of patients in the Georgetown/MADRS dataset who received (or were planned to receive) each of the treatments and interventions that were statistically significant predictors of episode cost and the average change in costs associated with each treatment. The overall average cost of a home health episode in this sample was $940; various treatments were associated with changes in average costs of up to half that amount. For example, skilled nursing wound care was associated with an increase of $470 in the cost of an episode. All treatments and nursing interventions in Table I.1 were associated with higher-than-average costs, except for "speech therapy evaluation only." "Speech therapy evaluation only" by itself was associated with a reduction in cost, but when combined with the "any treatment" measure was not associated with a substantial increase or reduction in cost.

An important consideration for designing a case-mix payment adjustor is whether the adjustor creates incentives for agencies to provide care to patients that will provide a higher payment to the agency but not necessarily benefit the patient. Since including planned Medicare treatments in a case-mix adjustor may create this type of inappropriate incentive to agencies, the adjustor should be

TABLE I.1

INCIDENCE OF TREATMENTS AND NURSING INTERVENTIONS OF INTEREST AND THEIR EFFECT ON AVERAGE COST PER EPISODE

Treatment/Nursing Intervention	Percentage of Patients Receiving Treatment/Intervention	Additional Cost Per Episode for Patients Receiving Treatment/ Intervention
Skilled Nursing		
Bladder Instillation (A3)	1.6	$261
Open Wound Care (A4)	17.9	$470
Decubitus Care (Stage 3,4,5) (A5)	3.9	$173
Venipuncture (A6)	20.8	$267
Administration of B12 (A11)	1.1	$345
Administration of Other Injections (A13)	2.1	$155
Teaching Gastrostomy Feeding (A18)	0.9	$281
Teaching Diabetic Care (A25)	13.2	$193
Decubitus Care (Stage 1,2) (A29)	4.9	$150
Cardiopulmonary Condition Care (NI 050)	36.3	$79
Infusion Care (NI 26)	2.7	$288
Respiratory Care (NI 45)	10.1	$78
Vital Signs (NI 54)	25.7	$100
Physical Therapy		
Any Treatment	20.9	$117
Therapeutic Exercise (B2)	16.7	$287
Speech Therapy		
Any Treatment	2.0	$380
Evaluation Only (C1 only)	0.2	-$453
Speech Articulation Disorder (C3)	1.1	$378
Occupational Therapy		
Any Treatment	4.2	$190
Muscle Re-education (D3)	1.8	$478
Medical Social Services		
Any Treatment	12.4	$84
Short-Term Therapy (E4)	2.1	$199

TABLE I.1 (continued)

Treatment/Nursing Intervention	Percentage of Patients Receiving Treatment/Intervention	Additional Cost Per Episode for Patients Receiving Treatment/ Intervention
Home Health Aide		
Any Treatment	35.0	$279
Partial/Complete Bed Bath (F2)	22.8	$124
Exercises (F10)	6.8	$156

NOTE: Letter/number combinations in parentheses following the treatment or intervention names are Medicare treatment codes and Georgetown nurisng intervention codes.

The average cost of an episode of home health care for this sample was $940. Estimates of additional cost per episode come from the reduced stepwise regression model (column 4) of Table A.6.

based on the patient and environmental characteristics that prompt clinicians to plan these relatively more expensive treatments, rather than on the treatments themselves. Thus, on May 8, 1992, MPR convened a panel of professionals in each of the home health disciplines to discuss the patient and environmental characteristics that lead to recommendations for the identified treatments. (Table I.2 provides a list of the panel members.)

Although the mandate for the panel--to describe the types of patients who receive the identified treatments from each discipline--sounds simple, the task is actually quite complex. The type and level of home health treatment anticipated for a patient is initially based on many, often interacting factors: primary and secondary diagnoses at admission; chronic conditions and the general level of debilitation and clinical stability; the patient's ability to perform daily activities; the motivation and ability of the patient to relearn these activities or to perform other required activities, such as the administration of injections or wound care; and the availability of informal caregivers and their ability to perform or help perform required activities. Nevertheless, the panel suggested many characteristics that they have observed affect the type and level of care received by Medicare home health patients.

TABLE 1.2

HOME HEALTH PROSPECTIVE PAYMENT CLINICAL PANEL ON TREATMENTS
PARTICIPANTS IN THE MAY 8, 1992 MEETING

Physical Therapy

Ms. Laurita Hack, PT, MBA, PhD
Philadelphia Institute for Physical Therapy
Philadelphia

Mr. Gary Mumford, RPT
Gary Mumford and Associates
Kansas City

Occupational Therapy

Ms. Cindy Brillman, OTR/L
Private practice occupational therapist
Bryn Mawr, Pennsylvania

Ms. Linda McClung, OTR/L
Private practice occupational therapist
Birmingham, Alabama

Speech Therapy

Dr. Robert Goldfarb, PhD
Lehman College of CUNY and VNS of New York
New York City

Ms. Deborah A. King, MA
Deborah A. King and Associates
Shawnee Mission, Kansas

Medical Social Services

Ms. Pearl Graub, MSS
Philadelphia Corporation for Aging
Philadelphia

Ms. Ellen Harrington, MSW, LICSW
Boston University Home Medical Service
Boston

Nursing

Ms. Tish Coppinger, RN, BSN
Kimberly Quality Care
Kansas City

Geriatrics

Dr. Roberta Meyers, MD, MPH
Hennepin County Medical Center
Minneapolis

II. SUMMARY OF CLINICAL PANEL MEETING ON MEDICARE HOME HEALTH TREATMENTS

In preparation for the meeting, panel members received the results of regressions of the receipt of those home health treatments found to be associated with above-average home health episode costs on patient characteristics from the Georgetown/MADRS database constructed for the first phase of the case-mix analysis. These results were presented in a descriptive context as a starting point for thought and discussion. Discussion of the types of patients who receive each treatment began with a question about whether the Georgetown results were clinically reasonable (since a small number of the empirical associations were likely to have been observed by chance). Except where noted, the panel found that the patient characteristics identified by the Georgetown data were clinically reasonable. Discussion then focused on the characteristics beyond those available in the Georgetown data that would contribute to predicting the treatments of interest.

Some of the characteristics that the panel suggested would enhance predicting the home health treatments of interest are hypothesized to predict the *level of service use* under the treatment, rather than the *incidence* of the treatment. For example, the length or intensity of therapy service is likely to be affected by the ability of the patient (or informal caregiver) to learn and practice exercises. Similarly, a change in an informal caregiver (or an informal caregiver's ability) is likely to affect the length or intensity of services devoted to gastrostomy or diabetic teaching.

The characteristics that the panel suggested would predict treatment have been grouped loosely into five categories for expository purposes:

- The first category includes medical diagnoses or procedures that are either included with other conditions in our current coding schemes based on primary and secondary

diagnoses listed on the HCFA 485 or that may not appear among the primary or secondary diagnoses on the HCFA 485.[1]

- The second category of characteristics suggested by the panel includes the presence of orders for various types of medications and their method of administration.

- The third category contains measures of other physical conditions and financial conditions.

- The fourth category contains measures of the emotional and cognitive status of the patient.

- The fifth category contains measures that describe the informal caregiving situation.[2]

A. PHYSICAL THERAPY (PT) TREATMENTS

"Any PT" and "therapeutic exercise" were associated with increased episode costs of $117 and $287, respectively (21 percent of the patients received some type of physical therapy treatment during their home health episodes; 17 percent received therapeutic exercise). Because "PT evaluation only" was not associated with atypical costs and because most patients who receive PT receive "therapeutic exercise," panel members believed that "any PT" identifies patients with a PT evaluation and limited subsequent treatment, while "therapeutic exercise" identifies patients with a fuller course of treatment that includes a range of therapy treatments, rather than the sole receipt of therapeutic exercise.[3] Patients might receive limited treatment if they were so impaired that the therapist provided a short

[1]Our coding schemes for medical diagnoses and procedures are designed to group primary diagnoses and procedures according to the type and amount of home health care associated with them. Our coding scheme groups secondary diagnoses that increase the amount of care required for the primary diagnosis or procedure. Thus, the panel's recommendations for medical diagnoses necessitate refining our approach.

[2]Drafts of questions that capture these measures and the treatment hypothesized to be affected by the measures appear in Appendix Tables B.1 through B.5. The draft questions must be refined before they are included in a data collection instrument, and they are presented here for illustrative purposes only.

[3]In the Georgetown/MADRS database, 1,015 patients received some type of physical therapy treatment. Of those, nearly 80 percent received therapeutic exercise and at least one other physical therapy treatment; and nearly 40 percent of those who received therapeutic exercise also received evaluation, transfer training, home program, and gait training.

course of instruction to informal caregivers, rather than a fuller course of treatment to the patient, or if after a visit or two it became clear that the patient needed time to adjust to his or her altered physical condition before starting a full course of therapy.

In addition to the primary and secondary diagnoses and surgical procedures identified in the Georgetown data as predicting the receipt of any PT or therapeutic exercise, the panel noted several specific predictors of any PT receipt and therapeutic exercise (see Table II.1). Some are embedded in the current diagnostic groupings and must be disaggregated: osteoarthritis, osteoporosis, compression fracture of the spine, hip fracture, total joint replacement, Parkinson's disease, and some heart conditions, such as congestive heart failure, myocardial infarction, coronary artery disease, and cardiac insufficiency.[4] Other conditions that affect the receipt of treatment may or may not be primary or secondary diagnoses, and may thus require separate questions: ataxic gait, generalized weakness, and pain.[5] (Appendix Table B.1 provides a checklist that could be used to collect information on these and other conditions.)

The panel suggested that ***changes in functioning*** just prior to home health admission were important predictors of the receipt of PT (and OT), as were measures of ADL limitations at admission. For example, a fall with severe consequences to the patient in the 1 or 2 months prior to home health admission, an increase in the incidence of falling of 1 to 3 times per month in the 1 or 2 months prior to admission, or a change in the ability of the patient to ambulate, dress, or perform other ADLs in the 1 or 2 months prior to admission are often cues to the patient's physician (or the home health agency) to order a PT (or OT) evaluation. Similarly, the receipt of new adaptive/assistive equipment or a change in such equipment could also cue a PT (or OT) evaluation to assess whether the patient needs to learn how to use the equipment.

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[4]PTs teach energy conservation techniques to patients with specific heart conditions.

[5]Pain can be associated with either an increase or a reduction in the use of PT. The latter would be observed if the pain were so severe that the patient could not carry out exercise regimens.

TABLE II.1

FACTORS ASSOCIATED WITH MEDICARE HOME HEALTH PHYSICAL THERAPY TREATMENTS: SUMMARY OF THE MAY 8, 1992 CLINICAL PANEL MEETING

Treatment	Empirically Derived from the Georgetown Data	Recommended by the Clinical Panel
Any Physical Therapy	*Primary Medical Diagnosis/Procedure* Knee or hip surgery Amputation Monitoring lesser surgical procedures Upper or lower limb fracture Degenerative neuromuscular disease Head injury Back disorder Stroke	*Primary Medical Diagnosis/Procedure* Osteoarthritis/osteoporosis Compression fracture of the spine Hip fracture Joint replacement Parkinson's disease Spinal cord injury
	Secondary Diagnosis Neurological disease Paralysis	*Secondary Diagnosis* Heart disease: COPD, CHF, MI, other cardiac procedures Ataxic or unsteady gait Generalized weakness/paresis Pain
	Other Physical Conditions Difficulty with ambulation Use of wheel chair Dependence in toileting or transferring	*Other Physical Conditions* Increase in the frequency of falling prior to or during HH episode New physician order for equipment or change in equipment Change in ability to ambulate, dress, or perform other ADLs prior to HH episode
		Emotional/Cognitive Conditions Adjustment reaction to physical change/depression associated with stroke or amputation Ability to cope with medical and social problems Noncompliance with plan of care/general level of cooperativeness Level of comprehension (ability to carry out or retain instructions) Disorientation/confusion Source of cognitive impairment
		Informal Caregiver Characteristics Change in informal caregiver involved with PT program Ability to cope with medical and social problems of patient and affecting home PT program Whether primary informal caregiver is frail, disabled, or in poor health
	Demographics and Other Variables Minority status Discharged to HH from hospital or SNF	

TABLE II.1 (continued)

Treatment	Empirically Derived from the Georgetown Data	Recommended by the Clinical Panel
PT Therapeutic Exercise (B2)	*Primary Medical Diagnosis/Procedure* Knee or hip surgery Amputation Upper or lower limb fracture Degenerative neuromuscular disease Head injury Back disorder Stroke	*Primary Medical Diagnosis/Procedure* Osteoarthritis/osteoporosis Compression fracture of the spine Hip fracture Joint replacement Parkinson's disease Spinal cord injury
	Secondary Diagnosis Paralysis	*Secondary Diagnosis* Heart disease: COPD, CHF, MI, other cardiac procedures Ataxic or unsteady gait Generalized weakness/paresis Pain
	Other Physical Conditions Difficulty with ambulation Use of wheel chair Dependence in toileting or transferring	*Other Physical Conditions* Increase in the frequency of falling prior to or during HH episode New physician order for equipment or change in equipment Change in ability to ambulate, dress, or perform other ADLs prior to HH episode
		Emotional/Cognitive Conditions Adjustment reaction to physical change/depression associated with stroke or amputation Ability to cope with medical and social problems Disorientation/confusion Noncompliance with plan of care/ general level of cooperativeness Level of comprehension (ability to carry out or retain instructions) Source of cognitive impairment
		Informal Caregiver Characteristics Change in informal caregiver involved with PT program Whether primary informal caregiver is frail, disabled, or in poor health Ability to cope with medical and social problems of patient and affecting home PT program whether primary informal caregiver is frail, disabled, or in poor health
	Demographics and Other Variables Minority status Discharged to HH from hospital or SNF	

The panel noted the importance of emotional and cognitive factors in predicting the receipt of therapy treatments--the ability to cope with illness and disability, the motivation to carry out and comply with a plan of care, and the comprehension level of the patient (or of the informal caregiver, if the informal caregiver is actively involved in the care of the patient). Since these are potentially complicated characteristics to measure, the panel suggested taking a straightforward approach of asking home health agency staff whether the patient (and the informal caregiver) is adequately motivated, cooperative, and compliant, whether the patient (and the informal caregiver) is coping adequately with the patient's illness or disability, and whether the patient (and the informal caregiver) is disoriented or depressed and able to comprehend instruction. Two straightforward measures of comprehension were suggested: assessing the ability of the patient (or caregiver) to carry out and retain instructions, and assessing the ability of the patient (or caregiver) to understand spoken, written, or gestured language.

The panel pointed out further that characteristics such as motivation, coping, and compliance might best measured part way into the episode or at the end of the episode, since it would be difficult to separate more pervasive problems from a short-term adjustment reaction to a physical problem or depression common to a recent stroke or amputation. The panel also noted that the source of cognitive impairment was an important predictor of therapy receipt for patients with difficulties in comprehension. Head-injury patients have longer courses of treatment, while therapy with dementia patients often entails instructing informal caregivers and is usually shorter.

The panel noted that each of the emotional/cognitive conditions could be associated with either an increase or a reduction in service use. The presence of depression or a lack of comprehension or motivation could prolong a therapy course of treatment; on the other hand, their presence could shorten a course of treatment if the patient was too impaired to participate fully. Therapists on the panel remarked that they frequently gave patients a two-week trial of therapy in order to determine whether a full course of treatment would be warranted at a given point in the episode.

When an informal caregiver must be an active participant in a therapy program, the ability of the caregiver to assist with exercises and to cope with the patient's illness or disability may affect the amount of care required from the therapist. Thus, as noted earlier, we must attempt to measure the ability of the caregiver to cope with the caregiving situation. In addition, a change in the caregiver when a caregiver must be involved in the therapy program would also imply an increase in service receipt because the new caregiver would have to be trained.

Panel members suggested that demographic characteristics were not important predictors of the use of therapy services.[6] The panel believed that the consistent empirical finding that minority status is associated with an increased receipt of therapy services reflects the generally poorer health status of older minority persons.

B. OCCUPATIONAL THERAPY (OT) TREATMENTS

"Any OT" and "muscle re-education" were associated with increased episode costs of $190 and $478, respectively (4 percent of the patients received some type of occupational therapy during their home health episodes; 2 percent received muscle re-education). As with PT, the panel believed that "any OT" identifies patients who receive evaluation and a short course of treatment, while "muscle re-education" identifies patients who receive muscle re-education in a comprehensive program of several OT treatments, rather than reflecting the treatment by itself.[7]

Panel members suggested that home health patients who receive OT share many of the characteristics of those who receive PT; however, they described OT patients as more complex

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[6]However, some of the therapists on the panel observed that therapists generally tend not to go into home care, and that some therapists who work in home health prefer younger clients or patients with acute orthopedic problems, and do not like working with more typical older Medicare home health patients. The shortage of therapists is particularly acute in inner-city and rural areas. One panel member reported that therapy assistants are increasingly being used to mitigate the shortage of therapists.

[7]In the Georgetown/MADRS database, 206 patients received some type of occupational therapy treatment. Of those, 42 percent received muscle re-education and at least one other occupational therapy treatment; 91 percent of those who received muscle re-education also received evaluation and independent living training.

patients (and perhaps more debilitated), because they need to relearn the detailed steps required to carry out ADL and IADL activities safely in their homes, in addition to requiring the rehabilitative services routinely provided by PT to improve their ambulation and transfer ability.[8] Since all patients who receive OT tend to require learning ADL and IADL skills, the increased cost for patients who receive muscle re-education, while due primarily to the cost of the therapy, may also be due in part to the fact that they use home health aides while they relearn skills. In fact, among the Georgetown sample, 65 percent of OT patients also had visits from home health aides (compared with 37 percent of the overall Georgetown sample).

The primary and secondary diagnoses and other physical conditions that panel members believed were associated with OT are similar to those associated with PT (see Table II.2). Changes in functioning that cue OT treatment include changes in the ability to eat, dress, maintain personal hygiene, and perform such IADLs as homemaking and money management. The emotional problems and cognitive limitations of the patient and the caregiver that increase or reduce the receipt of OT treatments were the same as those that affect the receipt of PT.

C. SPEECH THERAPY (ST) TREATMENTS

"Any ST" and "speech articulation disorder" were associated with increased episode costs of $380 and $388, respectively. By contrast, "ST evaluation only" was associated with reduced costs of $453.[9] (Among the Georgetown sample, 2 percent of patients received some type of speech therapy, a fifth

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[8]The suggestion that OT patients are more debilitated than PT-only patients was borne out to some degree by the Georgetown regression results, in that OT treatment was associated with dependence in feeding and having been discharged to home health from a SNF. In addition, "muscle re-education" was associated with a primary diagnosis at admission of "medication supervision," which the panel indicated serves as a proxy for more general concerns about the safety of the patient in his or her home.

[9]The magnitudes of the increase associated with "any ST" and the reduction associated with "evaluation only" suggest that patients receiving only a speech evaluation had approximately average episode costs.

TABLE II.2

FACTORS ASSOCIATED WITH MEDICARE HOME HEALTH OCCUPATIONAL THERAPY TREATMENTS
SUMMARY OF MAY 8, 1992 CLINICAL PANEL MEETING

Treatment	Empirically Derived from the Georgetown Data	Recommended by the Clinical Panel
Any Occupational Therapy	*Primary Medical Diagnosis/Procedure* Upper limb fracture Degenerative neuromuscular disease Head injury Stroke	*Primary Medical Diagnosis/Procedure* Osteoarthritis/osteoporosis Compression fracture of the spine Hip fracture Joint replacement Parkinson's disease Knee or hip surgery Amputation Lower limb fracture Back disorder Spinal cord injury
	Secondary Diagnoses Paralysis	*Secondary Diagnosis* Heart disease: COPD, CHF, MI, other cardiac procedures Generalized weakness/paresis Pain Neurological disease Dysphagia
	Other Physical Conditions Use of cane or crutches Use of wheelchair Dependence in feeding or toileting	*Other Physical Conditions* Increase in the frequency of falling prior to or during HH episode New physician order for equipment or change in equipment Change in ability to perform ADLs or IADLs just prior to HH episode Cannot safely conduct needed activities at home
		Emotional/Cognitive Conditions Adjustment reaction to physical change/depression associated with stroke or amputation Ability to cope with medical and social problems Noncompliance with plan of care/ general level of cooperativeness Level of comprehension (ability to carry out or retain instructions) Disorientation/confusion Source of cognitive impairment
		Informal Caregiver Characteristics Change in informal caregiver involved with OT program Ability to cope with medical and social problems of patient and affecting home OT program Whether primary informal caregiver is frail, disabled, or in poor health
	Demographics and Other Variables Minority status Discharged to HH from SNF Age less than 65	

TABLE II.2 (continued)

Treatment	Empirically Derived from the Georgetown Data	Recommended by the Clinical Panel
OT Muscle Re-Education (D3)	*Primary Medical Diagnosis/Procedure* Upper limb fracture Degenerative neuromuscular disease Head injury Stroke Medication supervision	*Primary Medical Diagnosis/Procedure* Osteoarthritis/osteoporosis Compression fracture of the spine Hip fracture Joint replacement Parkinson's disease Knee or hip surgery Amputation Lower limb fracture Back disorder Spinal cord injury
	Secondary Diagnoses Paralysis Depression	*Secondary Diagnosis* Heart disease: COPD, CHF, MI, other cardiac procedures Generalized weakness/paresis Pain Neurological disease
		Other Physical Conditions Increase in the frequency of falling prior to or during HH episode New physician order for equipment or change in equipment Change in ability to perform ADLs or IADLs just prior to HH episode
		Emotional/Cognitive Conditions Adjustment reaction to physical change/depression associated with stroke or amputation Ability to cope with medical and social problems Noncompliance with plan of care/ general level of cooperativeness Level of comprehension (ability to carry out or retain instructions) Disorientation/confusion Source of cognitive impairment
		Informal Caregiver Characteristics Change in informal caregiver involved with OT program Ability to cope with medical and social problems of patient and affecting home OT program Whether primary informal caregiver is frail, disabled, or in poor health
	Demographics and Other Variables Minority status Discharged to HH from SNF Age less than 65	

of 1 percent had only a speech therapy evaluation, and 1 percent had treatment for a speech articulation disorder.)

The panel suggested that the following conditions characterize home health patients who might receive a speech evaluation and no other speech treatment: patients who appear to have difficulty with swallowing, patients for whom a physician is considering inserting a nasogastric (or other type of) feeding tube, patients who suffer from malnutrition, and patients who suffer from swallowing or speech difficulties due to previous strokes[10] (see Table II.3).

In addition to the primary and secondary diagnoses identified in the Georgetown data, the panel noted several specific diagnoses that predict any ST receipt and treatment for speech articulation disorders. Some are embedded in the current diagnostic groupings and must be disaggregated, while others may require separate questions. The former category includes laryngectomy (currently grouped with tracheostomy, which seldom requires the intervention of an ST) and hearing disorders (currently grouped with eye problems). The latter category includes cerebrovascular accident (CVA) with left hemispheric damage (since the sight of the CVA is not indicated in the diagnosis codes), voice disorders, dysarthria, and apraxia.

The same emotional and cognitive characteristics of the patient and informal caregiver that increase or reduce the level of PT or OT receipt apply to ST. In addition, one of the STs on the panel suggested that speech prognosis would be an indicator of the amount of ST required. Patients who have a very favorable or poor prognosis receive a relatively low level of treatment; patients whose prognoses fall in the middle range receive the most. The panel member suggested that a speech prognosis could be constructed by first assigning an expected level of communication from one of four categories--unassisted communication, assisted communication, limited communication, or

[10]Some patients with swallowing problems do receive ST treatment in addition to evaluation. Due to concerns about the safety of the in-home treatment of a patient who has trouble swallowing, such treatment is usually limited to educating the informal caregiver or home health aide about the appropriate diet for the patient and the optimal position for feeding the patient.

TABLE II.3

FACTORS ASSOCIATED WITH MEDICARE HOME HEALTH SPEECH THERAPY TREATMENTS: SUMMARY OF MAY 8, 1992 CLINICAL PANEL MEETING

Treatment	Empirically Derived from the Georgetown Data	Recommended by the Clinical Panel
Any Speech Therapy	*Primary Medical Diagnosis/Procedure* Eye/ear care Tracheostomy Enteral feeding Head injury Stroke	*Primary Medical Diagnosis/Procedure* CVA with left hemispheric damage Laryngectomy Hearing problems Voice disorders
	Secondary Diagnoses Neurological disease Depression	
	Other Physical Conditions Difficulty with speech Difficulty with communication	*Other Physical Conditions* Speech prognosis excellent, good, fair, or poor for unassisted communication, assisted communication, limited communication, or assisted swallowing
		Emotional/Cognitive Conditions Adjustment reaction to physical change/depression associated with stroke or amputation Ability to cope with medical and social problems Noncompliance with plan of care/ general level of cooperativeness Level of comprehension (ability to carry out or retain instructions) Disorientation/confusion Source of cognitive impairment
		Informal Caregiver Characteristics Change in informal caregiver involved with ST program Ability to cope with medical and social problems of patient affecting home ST program
	Demographics and Other Variables Discharged to HH from SNF	
ST Evaluation Only (C1 Only)	*Primary Medical Diagnosis/Procedure* Serious degenerative neuromuscular disease Stroke	
	Secondary Diagnosis Neurological disease Malnutrition Eye/ear care	*Secondary Diagnosis* Old stroke Swallowing problems/dysphagia Planned NG tube insertion

TABLE II.3 (continued)

Treatment	Empirically Derived from the Georgetown Data	Recommended by the Clinical Panel
	Other Physical Conditions Use of cane or crutches Difficulty with speech	*Other Physical Conditions* Speech prognosis excellent, good, fair, or poor for unassisted communication, assisted communication, limited communication, or assisted swallowing
	Demographics and Other Variables Discharged to HH from SNF Number of HH visits during last 6 months	
ST Speech Articulation Disorder (C3)	*Primary Medical Diagnosis/Procedure* Eye/ear care Enteral feeding Head injury Stroke	*Primary Medical Diagnosis/Procedure* CVA with left hemispheric damage Laryngectomy Hearing problems Voice disorders
	Secondary Diagnosis Depression	*Secondary Diagnosis* Dysarthria Apraxia
	Other Physical Conditions Use of wheel chair Difficulty with speech Difficulty with communication	*Other Physical Conditions* Speech prognosis excellent, good, fair, or poor for unassisted communication, assisted communication, limited communication, or assisted swallowing
		Emotional/Cognitive Conditions Adjustment reaction to physical change/depression associated with stroke Ability to cope with medical and social problems Noncompliance with plan of care/ general level of cooperativeness Level of comprehension (ability to carry out or retain instructions) Disorientation/confusion Source of cognitive impairment
		Informal Caregiver Characteristics Change in informal caregiver involved with ST care plan Ability to cope with medical and social problems of patient affecting home ST program

assistance in swallowing--and then assigning the prognosis--excellent, good, fair, or poor--to the expected level.

D. MEDICAL SOCIAL SERVICE (MSS) TREATMENTS

"Any medical social services" and "short-term therapy" were associated with increased episode costs of $84 and $199, respectively (12 percent of patients received some type of medical social services during their home health episode; 2 percent received short-term therapy). The "receipt of short-term therapy" was *not* considered to represent a range of social services, as were "therapeutic exercise" and "muscle re-education" for PT and OT. Rather, "short-term therapy" primarily captures patients who receive this specific type of treatment. Short-term therapy is used primarily to treat patients with a reactive depression (due to the loss of a limb, the loss of a loved one, or severe limitations in activities due to a newly diagnosed physical problem, such as a stroke or hip replacement), as well as those who require behavioral modification (for example, due to a newly diagnosed heart condition), and patients and informal caregivers with dysfunctional relationships that adversely affect the chronicity of the patient's illness.

The Georgetown database, with its emphasis on medical diagnoses and physical conditions but not on emotional and caregiving difficulties, was particularly ill-suited for predicting the use of medical social service treatments. Few medical diagnoses were identified in the Georgetown database as predicting MSS treatments (see Table II.4). Cognitive impairment as a primary diagnosis and depression and malnutrition as secondary diagnoses predicted "any MSS," while infectious disease and urinary catheter as primary diagnoses and depression as a secondary diagnosis predicted "short-term therapy." The panel believed that the association between these diagnoses and the receipt of MSS seemed reasonable, except for infectious disease, which may have been a statistical artifact. The panel suggested several other medical diagnoses, noted earlier, that can cause a reactive depression or that may require behavioral modification.

TABLE II.4

FACTORS ASSOCIATED WITH MEDICARE HOME HEALTH MEDICAL SOCIAL SERVICE TREATMENTS:
SUMMARY OF THE MAY 8, 1992 CLINICAL PANEL MEETING

Treatment	Empirically Derived from the Georgetown Data	Recommended by the Clinical Panel	Mentioned in the NASW Home Health Guidelines
Any Medical Social Services	*Primary Medical Diagnosis/Procedure* Cognitive impairment	*Primary or Secondary Diagnosis* Cerebrovascular accident Congestive heart failure Rheumatoid arthritis Sight impairment Alcohol abuse Cancer	
	Secondary Diagnosis Depression Malnutrition		
	Other Physical Conditions Difficulty with comprehension	*Other Physical/Financial Conditions* Change in eating habits prior to or during HH episode Change in ability to ambulate, dress, or perform other ADLs prior to or during HH episode Difficulty with financial management Need for conservatorship or guardianship arrangements Need for help applying for services	*Other Physical/Financial Conditions* Introduction of high-tech equipment
		Emotional/Cognitive Conditions Change in willingness to get out of bed or leave the house Traumatic loss such as death of a spouse Noncompliance with plan of care Adjustment reaction to physical change Difficulty making decisions Suicidal ideation	*Emotional/Cognitive Conditions* Patient anxious, angry, or depressed Patient vulnerable to abuse or neglect
		Informal Caregiver Characteristics Ability to cope with medical and social problems of patient that affect the recovery of the patient Number of informal caregivers Whether primary informal caregiver is frail, disabled, or in poor health Whether primary informal caregiver has other responsibilities	*Informal Caregiver Characteristics* Caregiver is overwhelmed, frightened, indifferent, or angry
	Demographics and Other Variables Minority status Receiving Medicaid		

TABLE II.4 (continued)

Treatment	Empirically Derived from the Georgetown Data	Recommended by the Clinical Panel	Mentioned in the NASW Home Health Guidelines
MSS Short-Term Therapy (E4)	*Primary Medical Diagnosis/Procedure* Urinary Catheter	*Primary or Secondary Diagnosis* Hip replacement Amputation Cerebrovascular accident Hypertension Angina Anxiety	
	Secondary Diagnosis Depression		
	Other Physical Conditions Difficulty with comprehension	*Other Physical/Financial Conditions* Difficulty with financial management	
		Emotional/Cognitive Conditions Traumatic loss such as death of a spouse Noncompliance with plan of care Adjustment reaction to physical change	
		Informal Caregiver Characteristics Ability to cope with medical and social problems of patient that affect the recovery of the patient Ability to cope with planned nursing home placement or imminent death of patient	
	Demographics and Other Variables Minority status		

Recent changes in eating habits or ADL/IADL functioning were suggested as cues for ordering MSS evaluations, as were planning for conservatorship or guardianship arrangements or difficulties with financial management (such as paying bills). Emotional and cognitive conditions that frequently lead to an order for MSS evaluation include a change in the willingness of the patient to get out of bed or leave the house, a traumatic loss to the patient (such as the death of a spouse or caregiver), noncompliance with a nursing care plan, a problem adjusting to a physical change (such as an amputation or a new and severe limitation in permitted activity), difficulty in making decisions, and suicidal ideation. An indication that the patient's informal support system is in jeopardy will also cue an MSS evaluation. (Appendix Tables B.3 to B.5 provide examples of questions that capture measures of nondiagnostic physical conditions, financial problems, emotional and cognitive problems, and the characteristics of informal caregivers.)

The National Association of Social Workers notes the following as "intake cues for social work referral" among home health patients (Blanchard, Gill, and Williams, 1991):

- Elderly patients who live alone, particularly if they are physically or mentally impaired
- Patients who depend on an elderly or infirm caregiver or who themselves are responsible for a child or disabled adult
- Patients who are anxious, fearful, angry, depressed, or engaging in suicidal ideation
- Patients with limited funds or limited insurance or who need assistance in gaining access to community resources
- Patients who require complex or high-technology equipment, particularly if the equipment is unfamiliar
- Patients whose informal caregiver is overwhelmed, frightened, indifferent, or angry
- Patients who are vulnerable to neglect or abuse

The panel suggested that complex problems with informal caregivers or financial management that affect the ability of the patient to recover were most often associated with the use of the "short-term therapy" treatment. In such situations, a short course of goal-oriented therapy is used to sort

out problems and identify potential solutions. In order for short-term therapy with a patient to be successful, the patient must have adequate cognitive skills. The empirical association between "comprehension difficulty" and the use of short-term therapy may suggest that this treatment is frequently given to the informal caregiver of a cognitively impaired patient. In addition, this treatment is used when the informal caregiver is having difficulty with a decision to place the patient in a nursing home or if the caregiver is overwhelmed by grief in the face of the imminent death of the patient.

E. HOME HEALTH AIDE TREATMENTS

"Any home health aide treatment," "partial/complete bed bath," and "assistance with exercises" were associated with increased episode costs of $279, $124, and $156 (35 percent of patients received some type of aide treatment; 23 percent received bed baths; and 7 percent received assistance with exercise).

Under the assumption that the patient needs the type of services provided by home health aides, the panel suggested that the use of aide treatments depends largely on the availability and ability of informal caregivers and the willingness of the patient and caregiver to accept a home health aide. Thus, although the panel did not disagree with the medical diagnoses and physical conditions identified by the Georgetown data as predicting aide treatments, most of their recommendations for additional predictive measures pertained to the ability of informal caregivers and the possibility of burnout (see Table II.5). However, suggestions for additional patient characteristics included the presence of decubiti and skin problems that required careful monitoring or daily care (such as intertriginous, perineal, or stasis dermatitis) and whether the patient was bed- or chairbound (since patients with these limitations may receive more than one aide visit per day).

The panel suggested asking the patient and caregiver directly whether they were willing to have an aide in their home; many elderly individuals prefer not to have strangers in their homes even when they need their assistance. In addition, when informal caregivers are available, the panel suggested

TABLE II.5

FACTORS ASSOCIATED WITH MEDICARE HOME HEALTH AIDE TREATMENTS
SUMMARY OF THE MAY 8, 1992 CLINICAL PANEL MEETING

Treatment	Empirically Derived from the Georgetown Data	Recommended by the Clinical Panel
Any Home Health Aide Treatment	*Primary Medical Diagnosis/Procedure* Upper limb fracture	
	Secondary Diagnosis COPD Incontinence	*Secondary Diagnosis* Decubitus ulcers Interiginous, perineal or stasis dermatitis
	Other Physical Conditions Uses chux or diapers Difficulty with ambulation Difficulty with hearing Difficulty with comprehension Dependence in bathing Dependence in dressing	*Other Physical Conditions* Bed- or chairbound Change in ability to perform ADLs or IADLs just prior to HH episode
		Emotional/Cognitive Conditions Willingness of patient to accept personal care from informal caregiver Willingness of patient and caregiver to accept care from a home health aide
	Informal Caregiver Characteristics Lives alone	*Informal Caregiver Characteristics* Number of informal caregivers Whether primary informal caregiver is frail, disabled, or in poor health Whether primary informal caregiver has other responsibilities Whether primary informal caregiver is willing and able to provide personal care Whether primary informal caregiver is willing and able to provide assistance with transfer if needed Number of short hospital stays (3 days or less) (as a proxy for imminent caregiver burnout) Number of ER visits in the last 3 months (as a proxy for caregiver burnout)
	Demographics and Other Variables Discharged to HH from hospital or SNF Number of HH visits during last 6 months Female	
Partial/Complete Bed Bath (F2)	*Primary Medical Diagnosis/Procedure* Upper limb fracture Back disorder	
	Secondary Diagnosis COPD Incontinence	

TABLE II.5 (continued)

Treatment	Empirically Derived from the Georgetown Data	Recommended by the Clinical Panel
	Other Physical Conditions Uses chux or diapers Difficulty with ambulation Difficulty with comprehension Dependence in bathing Dependence in dressing Dependence in feeding Dependence in transferring	*Other Physical Conditions* Bed- or chairbound
		Emotional/Cognitive Conditions Willingness of patient to accept personal care from informal caregiver Willingness of patient and caregiver to accept care from a home health aide
		Informal Caregiver Characteristics Whether primary informal caregiver is willing and able to provide personal care
	Demographics and Other Variables Discharged to HH from hospital or SNF Number of IP admissions during HH episode	
Exercises (F10)	*Primary Medical Diagnosis/Procedure* Hip surgery Amputation Stroke	
	Secondary Diagnosis Depression	
	Other Physical Conditions Comatose Dependence in dressing Dependence in feeding	
		Emotional/Cognitive Conditions Willingness of patient and caregiver to accept care from a home health aide
		Informal Caregiver Characteristics Whether primary informal caregiver is willing and able to help with exercises
	Demographics and Other Variables Discharged to HH from SNF Number of HH visits during last 6 months	

asking patients whether they would allow them to provide personal care, since, for example, some patients might be embarrassed by being bathed by a spouse or adult child, even if the spouse or child would be willing to help with the bath. Thus, given two equally frail patients/caregivers, the difference between the presence of aide treatments and their absence may be the willingness of the patient/caregiver to accept an aide or the willingness of the patient to accept certain types of help from an informal caregiver.

Measures were also suggested to assess the caregiver's availability, age, and ability to provide personal care for the patient or to assist with exercises (or a catheter) if such help is necessary. If the informal caregiver has other caregiving responsibilities, such as a dependent child or other elderly or disabled dependents, then the patient may be more likely to need care from a home health aide. On the other hand, if a patient has multiple informal caregivers, he or she would be less likely to require an aide. The panel also suggested using the number of inpatient stays of 3 days or less during the last 3 months as a proxy for caregiver burnout. Physicians will sometimes admit a patient to the hospital if the caregiving situation is in jeopardy. A large number of recent emergency room visits may indicate that the caregiver is already burned out.

F. SKILLED NURSE TREATMENTS

The case-mix analysis showed that nine Medicare skilled nursing treatments were significant predictors of above-average home health episode costs. Increases ranged from $155 to $470 for patients with these treatments. In this section, we discuss the characteristics of patients that are associated with the planned or actual use of these treatments. In Section G, we discuss the characteristics of patients that are associated with four Georgetown nursing interventions that were also found to be associated with above-average episode costs.

1. Bladder Instillation

"Bladder instillation" was associated with increased episode costs of $261 (just under 2 percent of patients in the Georgetown database had this treatment). The panel suggested that this treatment usually indicated bladder irrigation; bladder instillation--that is, the instillation of medication into the bladder--is rarely done at home. Bladder irrigation with a saline solution is commonly used to dislodge a blockage in the catheter of bedbound patients with long-term Foley catheter use.[11]

The panel did not suggest any primary or secondary diagnoses associated with the bladder instillation treatment beyond those described in the Georgetown data: urinary incontinence, the presence of a urinary catheter, cancer, end-stage renal disease, and paralysis. (An empirical association between lower limb fracture and this treatment may have been spurious, or the fracture may have necessitated using a catheter (see Table II.6).

The panel suggested that bladder instillation could be predicted more effectively with measures of (1) whether the patient had a Foley catheter, (2) whether the catheter was left in place for more than three weeks at a time, and (3) whether the patient was bed- or chairbound. They also suggested a measure of whether the patient or informal caregiver was able to care for the catheter on a daily basis.

2. Open Wound Care and Dressing

"Open wound care" was associated with increased episode costs of $470 (18 percent of patients had this treatment). The panel suggested that this treatment includes the care of trauma wounds in addition to postsurgical wounds, and the care of wounds from venous catheterization and ostomies.

The panel did not suggest any primary or secondary diagnoses associated with wound care treatment beyond those described in the Georgetown data (see Table II.7). Those identified in the Georgetown data include diagnostic groupings for wound care per se; care for ostomies and

[11]New guidelines on incontinence treatment from the National Institutes of Health recommend against using bladder irrigation and promote changing urinary catheters every four to six weeks to minimize problems that necessitate bladder irrigation.

TABLE II.6

FACTORS ASSOCIATED WITH MEDICARE HOME HEALTH NURSING TREATMENTS: BLADDER INSTILLATION
SUMMARY OF THE MAY 8, 1992 CLINICAL PANEL MEETING

Treatment	Empirically Derived from the Georgetown Data	Recommended by the Clinical Panel
Bladder Instillation (A3)	*Primary Medical Diagnosis/Procedure*	
	Urinary incontinence	
	Urinary catheter	
	Secondary Diagnosis	
	Cancer	
	End-stage renal disease	
	Incontinence	
	Paralysis	
	Other Physical Conditions	*Other Physical Conditions*
	Uses chux or diapers	Has had Foley catheter in place for over a month
	Uses enema or bowel kits	Bed- or chairbound
	Is comatose	
	Dependence for feeding	
		Informal Caregiver Characteristics
		Unable to learn catheter care
	Demographics and Other Variables	
	Discharged to HH from SNF	

TABLE II.7

FACTORS ASSOCIATED WITH MEDICARE HOME HEALTH NURSING TREATMENTS: WOUND AND DECUBITUS CARE SUMMARY OF THE MAY 8, 1992 CLINICAL PANEL MEETING

Treatment	Empirically Derived from the Georgetown Data	Recommended by the Clinical Panel
Open Wound Care/Dressing (A4)	*Primary Medical Diagnosis/Procedure* Ostomy care Amputation Monitoring heart surgery Monitoring other serious surgery Monitoring lesser procedures Enteral feeding Uncomplicated wound care Complicated wound care Administration of antibiotics Surgery on blood vessels	
	Secondary Diagnosis Slow healing due to secondary diagnosis of diabetes or peripheral vascular disease	
	Other Physical Conditions Uses chux or diaper	*Other Physical Conditions* Has wound with a drain Has infected wound Had wound debrided in hospital Wound located in place which is difficult for self care or care by informal Taking oral antibiotics Patient has a central venous line Patient needs help turning or positioning in bed Patient uses egg crate mattress Patient uses Hoyer lift Patient nutritional status poor
		Informal Caregiver Characteristics Caregiver unable to provide wound care
	Demographics and Other Variables Age less than 65 Discharged to HH from SNF	
Decubitus Care Stage 3-5 (A5)	*Primary Medical Diagnosis/Procedure* Complicated wound	
	Secondary Diagnosis Incontinence Paralysis	
	Other Physical Conditions Difficulty with speech Difficulty with communication Dependence in feeding	*Other Physical Conditions* Patient needs help turning or positioning in bed Patient uses egg crate mattress Patient uses Hoyer lift Patient nutritional status poor
		Informal Caregiver Characteristics Caregiver unable to provide decubitus care

TABLE II.7 (continued)

Treatment	Empirically Derived from the Georgetown Data	Recommended by the Clinical Panel
	Demographics and Other Variables Number of inpatient admissions during HH episode	
Decubitus Care Stage 1-2 (A29)	*Primary Medical Diagnosis/Procedure* Lower limb fracture Complicated wound	
	Secondary Diagnosis CHF Neurological disease Incontinence	
	Other Physical Conditions Uses chux or diapers Uses respiratory equipment Dependence in feeding	*Other Physical Conditions* Patient terminal Patient being considered for nursing home placement Patient level of debilitation
		Informal Caregiver Characteristics Ability to cope with medical and social problems of patient affecting recovery of patient

decubitus care, 60 percent received home health aide visits (compared with 37 percent of the sample overall).

The panel did not disagree with the primary and secondary diagnoses associated with decubitus care in the Georgetown data (see Table II.7). Many of the indicators that were suggested as improving the prediction of the treatment for open wound care were also suggested for predicting stage 3 to 5 decubitus care.

4. Venipuncture

"Venipuncture" was associated with increased episode costs of $267 (21 percent of patients had this treatment). This increase in episode costs seemed unusually large for the relatively simple procedure of drawing blood periodically. The panel suggested that patients who required venipuncture in the home--that is, those who could not go to a physician's office or laboratory for blood drawing or who did not have informal caregivers to take them out of the house for the blood drawing--represented a highly debilitated group with multiple skilled care needs or a group whose informal caregiving system was very limited or fragile.

The panel did not disagree with the patient characteristics associated with the venipuncture treatment identified in the Georgetown data (see Table II.8). However, they suggested that the following measures be added as predictors of the treatment: whether the patient uses medications that typically require venipuncture (such as anticoagulants, heart medications, or insulin), whether the patient is able to travel to a physician's office or lab to have blood drawn, and whether the informal caregiver is able and willing to transport the patient to have blood drawn. (Appendix Table B.2 contains a check list of medications that require monitoring with venipuncture.)

5. Injection of Vitamin B12

"Injection of vitamin B12" was associated with increased episode costs of $345 (just over 1 percent of patients had this treatment). Vitamin B12 is used primarily to treat pernicious anemia,

TABLE II.8

FACTORS ASSOCIATED WITH MEDICARE HOME HEALTH NURSING TREATMENTS: VENIPUNCTURE
SUMMARY OF THE MAY 8, 1992 CLINICAL PANEL MEETING

Treatment	Empirically Derived from the Georgetown Data	Recommended by the Clinical Panel
Venipuncture (A6)	*Primary Medical Diagnosis/Procedure* Diabetic care Serious cardiopulmonary disease Urinary catheter Acute serious respiratory disease Malnutrition Anemia Lymph disease Cerebrovascular disease Acute vascular lesion Gastrointestinal disorder	
	Secondary Diagnosis Diabetes Malnutrition	
	Other Physical Conditions Uses chux or diapers Difficulty with hearing Difficulty with ambulation Dependence in dressing	*Other Physical Conditions* Uses medications that require venipuncture (e.g., anticoagulants, heart medications, insulin) Cannot travel to physician's office or lab to have blood drawn
		Informal Caregiver Characteristics Ability to cope with medical and social problems of patient affecting recovery of patient
	Demographics and Other Variables Number of HH visits during last 6 months Number of inpatient admissions during HH episode	

and the incidence of this condition increases with age. Thus, the injection of vitamin B12 is also correlated with an increased level of debilitation. The panel conjectured that the very high per-episode cost for patients with this relatively simple treatment is due to their multiple chronic conditions and need for assistance, thus requiring the presence of a home health aide, as was hypothesized to be the case for venipuncture and the care of stage 1 or 2 decubiti. Among patients in the Georgetown database, the average age was 76.5 years, 37 percent received aide visits, an average of just under 5 home health aide visits were received in an episode of 120 days or less, and an average of just under 11 nursing visits were received. In comparison, among the 52 patients receiving vitamin B12 injections, the average age was 82 years, 62 percent received aide visits, an average of 12 aide visits were received, and an average of 13 nursing visits were received.

The panel did not disagree with the few characteristics identified in the Georgetown data as predicting the injection of vitamin B12; these characteristics were consistent with the hypothesis that patients with this treatment were relatively old and debilitated (see Table II.9). However, the most accurate predictor of the treatment is a measure of whether the patient had orders from a physician to administer vitamin B12 injections. The panel suggested that a measure of the availability and ability of an informal caregiver to provide help with ADLs and IADLs, if necessary, would predict whether the patient also received aide care.

6. Injection of Other Medications

The "injection of other medications" was associated with increased episode costs of $155 (2 percent of patients had this treatment, which involves the administration of any medication other than vitamin B12 or insulin). The panel indicated that the treatment code is used frequently for the administration of anti-emetics in conjunction with chemotherapy, psychotropic medications, calcimar for patients with osteoporosis, and pain-control medication for patients with terminal illness or back disorders.

TABLE II.9

FACTORS ASSOCIATED WITH MEDICARE HOME HEALTH NURSING TREATMENTS: INJECTION
SUMMARY OF THE MAY 8, 1992 CLINICAL PANEL MEETING

Treatment	Empirically Derived from the Georgetown Data	Recommended by the Clinical Panel
Injection of Vitamin B12 (A11)	*Primary Medical Diagnosis/Procedure* Anemia (separate pernicious anemia)	
	Other Physical Conditions Difficulty with hearing Legally blind	*Other Physical Conditions* Requires the administration of vitamin B12
	Informal Caregiver Characteristics Lives alone	*Informal Caregiver Characteristics* Unable/unwilling to provide needed care to patient
	Demographics and Other Variables Age greater than 85 Number of HH visits during last 6 months	
Injection of Medications (Other than Insulin and B12) (A13)	*Primary Medical Diagnosis/Procedure* Psychiatric monitoring Kidney disease Back disorders Anemia Lymph disease	
	Other Physical Conditions Uses wheel chair Dependence for medication administration[a]	*Other Physical Conditions* Uses medications that require IM/subcutaneous administration (antiemetics, calcimar or other medication for osteoporosis, pain medication, psychotropic medications)
	Demographics and Other Variables Number of inpatient admissions during HH episode	

[a]This variable does not measure traditional IADL dependence for medication administration, which captures the need for assistance with the administration of oral medications. Rather, this variable also reflects the need for assistance with IV medications.

The Georgetown data offered only limited insights into the types of patients who have this treatment, but essentially did not contradict the panel's observations about those types of patients (see Table II.9). However, the panel noted that the most reliable way to predict the injection of medication is to check for the presence of a physician's orders for the injections.

7. Gastrostomy Teaching

"Teaching gastrostomy feeding" was associated with increased episode costs of $281 (just under 1 percent of patients had this treatment). The panel indicated that this treatment would be used for patients with a new gastrostomy, those who had a problem with an old gastrostomy (for example, the tube became clogged, was dislodged, or had to be replaced), those who had developed pneumonia from aspirating food, and those who had a change in the caregiver who administered feedings.

The medical diagnoses and other physical conditions associated with gastrostomy teaching in the Georgetown data are generally clinically reasonable (see Table II.10). An exception is the primary diagnosis that indicates eye or ear care, which is likely to have been a spurious result. The association between tracheostomy care and this treatment is likely due to the fact that the tracheostomy care grouping includes patients with both gastrostomies and swallowing and related problems. The other physical conditions associated with gastrostomy treatment--being comatose, dependence in feeding, and the use of respiratory equipment--reflect the fact that very dependent patients receive this treatment.

8. Teaching Diabetic Care

"Teaching diabetic care" was associated with increased episode costs of $193 (13 percent of patients had this treatment). The panel noted that teaching diabetic care could entail an unusually wide-ranging number of required visits. Relatively few visits would be required if a patient with an old diagnosis of diabetes had a change in the type, dosage, or timing of insulin administration. Relatively more visits would be required for newly diagnosed diabetics, diabetics with new

TABLE II.10

FACTORS ASSOCIATED WITH MEDICARE HOME HEALTH NURSING TREATMENTS: GASTROSTOMY TEACHING
SUMMARY OF THE MAY 8, 1992 CLINICAL PANEL MEETING

Treatment	Empirically Derived from the Georgetown Data	Recommended by the Clinical Panel
Gastrostomy Teaching (A18)	*Primary Medical Diagnosis/Procedure* Ostomy care Tracheostomy care Enteral feeding Infectious diseases Malnutrition	*Primary Medical Diagnosis/Procedure* Aspiration pneumonia
	Secondary Diagnosis Malnutrition	
	Other Physical Conditions Uses enema or bowel kits Uses respiratory equipment Is comatose Dependence in feeding	*Other Physical Conditions* Inpatient discharge with new gastrostomy Infection, replacement, or other problem with old gastrostomy
		Informal Caregiver Characteristics New caregiver to provide gastrostomy feeding

prescriptions for insulin, or diabetics with a change in an informal caregiver, particularly if the patient or caregiver was having difficulty with learning how to inject the insulin. Noncompliance with a patient's dietary regimen could also cue this treatment.

Minority status and Medicaid receipt, statistically significant predictors of this treatment in the Georgetown data, were considered to be proxies for the relatively poorer general health status of individuals in minority groups and individuals receiving Medicaid benefits (see Table II.11).

As a better predictor of whether fewer or more visits would be required to teach diabetic care, the panel suggested adding four measures: new diagnoses of diabetes, changes in the insulin prescription for old diagnoses, the ability of the patient or informal caregiver to administer insulin injections (or a change in that ability, such as a change in visual acuity), and compliance with a therapeutic diet.

G. GEORGETOWN NURSING INTERVENTIONS

Four Georgetown nursing interventions were also found to be statistically significant predictors of home health episode costs: cardiopulmonary care, infusion care, respiratory care, and the monitoring of vital signs. The care planned or received in the nursing interventions was coded based on a retrospective review of patient records (including, but not limited to, Medicare treatment codes). In this section we discuss the characteristics of patients that are associated with each nursing intervention (see Table II.12).

1. Cardiopulmonary Care

"Cardiopulmonary care" was associated with increased episode costs of $79 (36 percent of patients in the Georgetown database had this intervention, which includes teaching and monitoring patients with heart and lung conditions and procedures). Medicare skilled nursing treatment codes of skilled observation, venipuncture, restorative nursing, chest physiotherapy, teaching of tracheostomy care, the administration of tracheostomy care, teaching inhalation, and other were all

TABLE II.11

FACTORS ASSOCIATED WITH MEDICARE HOME HEALTH NURSING TREATMENTS: DIABETIC TEACHING
SUMMARY OF THE MAY 8, 1992 CLINICAL PANEL MEETING

Treatment	Empirically Derived from the Georgetown Data	Recommended by the Clinical Panel
Diabetic Teaching (A25)	*Primary Medical Diagnosis/Procedure* Diabetic care	
	Secondary Diagnosis Diabetes	
	Other Physical Conditions Dependence for medication administration	*Other Physical Conditions* Change in dosage, timing or type of insulin Newly diagnosed diabetes Noncompliance with dietary regimen Difficulty in learning self-injection or change in ability to self-inject
		Informal Caregiver Characteristics New caregiver to provide diabetic care Difficulty in learning to inject patient or change in ability to inject
	Demographics and Other Variables Minority status Receiving Medicaid	

TABLE II.12

FACTORS ASSOCIATED WITH GEORGETOWN NURSING INTERVENTIONS
SUMMARY OF THE MAY 8, 1992 CLINICAL PANEL MEETING

Treatment	Empirically Derived from the Georgetown Data	Recommended by the Clinical Panel
Cardiopulmonary Care	*Primary Medical Diagnosis/Procedure* Tracheostomy Aerosol therapy Monitoring heart surgery Cardiopulmonary disease Acute, serious respiratory disease Cerebrovascular disease	*Primary Diagnosis/Procedure* Myocardial infarction Chronic obstructive pulmonary disease
	Secondary Diagnosis Congestive heart failure	
	Other Physical Conditions Difficulty with speech	*Other Physical Conditions* Orders for breathing exercises
	Demographics and Other Variables Minority status	
Infusion Care	*Primary Medical Diagnosis/Procedure* Cancer Infectious disease Kidney disease Malnutrition Antibiotics Lymph disease Surgery on blood vessels	*Primary Medical Diagnosis/Procedure* Osteomyelitis
	Secondary Diagnosis Cancer	
	Other Physical Conditions Dependence for medication administration	*Other Physical Conditions* Clinically stable Physician orders for infusion of medication Has central venous line
		Informal Caregiver Characteristics Available and able to monitor infusion and IV line
	Demographics and Other Variables Number of inpatient admissions during HH episode	
Respiratory Care	*Primary Medical Diagnosis/Procedure* Tracheostomy Aerosol therapy Acute, serious respiratory disease	*Primary Diagnosis/Procedure* Congestive heart failure Pneumonia Asthma Bronchitis
	Secondary Diagnosis Chronic obstructive pulmonary disease Depression	
	Other Physical Conditions Uses respiratory equipment Difficulty with comprehension	*Other Physical Conditions* Orders for breathing exercises

TABLE II.12 (continued)

Treatment	Empirically Derived from the Georgetown Data	Recommended by the Clinical Panel
Vital Signs	*Primary Medical Diagnosis/Procedure* Cerebrovascular disease *Other Physical Conditions* Difficulty hearing	

correlated with cardiopulmonary care. The panel agreed that four of these Medicare treatments--skilled observation, venipuncture, restorative nursing, and other--would often be coded as Medicare treatments in caring for a patient with cardiopulmonary problems.

The panel believed that the patient characteristics identified in the Georgetown data as predictors of cardiopulmonary care were clinically reasonable. The association between speech difficulty and this intervention was attributed to the fact that shortness of breath can affect speech. Minority race was again believed to be a proxy for poor health status. Beyond the Georgetown data, the panel suggested that specific diagnoses of myocardial infarction and chronic obstructive pulmonary disease be highlighted for predicting cardiopulmonary care. A patient's need for breathing exercises was also suggested as a predictor of this intervention.

2. **Infusion Care**

"Infusion care" was associated with increased episode costs of $288 (just under 3 percent of patients had this intervention, which includes intravenous (IV) therapy and venous catheter care). The Medicare skilled nurse treatment code for the administration of IV therapy was highly correlated with this intervention; other treatment codes correlated with the intervention infusion care were the insertion of a Foley catheter, open wound care, venipuncture, the administration of other medications, teaching parenteral nutrition, the administration of inhalation therapy, and stage 1 or 2 decubitus care. The panel agreed that the administration of IV therapy would be the most likely treatment code recorded for infusion care.

The panel agreed with the predictors of infusion care identified by the Georgetown data. In addition, they suggested disaggregating osteomyelitis from the current grouping of diagnoses because it is an infectious disease of the bones that requires a relatively long course of IV therapy. They recommended the following additional predictors: (1) a measure of physicians' orders for the infusion of medications (for example, antibiotics or chemotherapy);[13] (2) whether the patient has a central

[13]Antibiotics can be infused relatively quickly, while the infusion of chemotherapy takes longer.

venous line (since they may require more care than peripheral lines);[14] (3) whether the patient is clinically stable; and (4) whether the patient has an informal caregiver able to monitor an infusion and to identify problems with the IV line.

3. Respiratory Care

"Respiratory care" was associated with increased episode costs of $78 (10 percent of the patients had respiratory care, which includes breathing exercises, chest physiotherapy, and inhalation therapy). The Medicare skilled nurse treatment "teaching inhalation" was highly correlated with the Georgetown respiratory care intervention. Other Medicare treatments correlated with this intervention included restorative nursing, bowel and bladder training, chest physiotherapy (provided by a nurse), and the teaching and administration of tracheostomy care.

In general, the panel agreed with the predictors of respiratory care identified in the Georgetown data. It attributed the association between depression (as a secondary diagnosis) and difficulty in comprehending with the receipt of respiratory care to the following: patients who cannot breath properly may become depressed because they cannot carry out their normal activities, and a reduction in oxygen levels in the brain may lead to difficulty with comprehension. The panel also suggested disaggregating the primary diagnoses of congestive heart failure, pneumonia, acute and chronic asthma, and bronchitis from the current groupings as predictors of respiratory care. A measure of the need for breathing exercises was also suggested.

4. Vital Signs

The "vital signs" intervention was associated with increased episode costs of $100 (26 percent of patients had this intervention). The only Medicare treatments correlated with this intervention were "skilled observation" and "other." Very few patient characteristics from the Georgetown database were associated with the vital sign intervention. The relatively high increase in costs associated with

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[14]The panel noted that the association between mid-episode inpatient admissions and this treatment reflects admissions to treat problems with central venous catheters.

the rather routine intervention of taking vital signs puzzled us and the panel. The panel conjectured that, as with the Medicare treatments venipuncture and stage 1 or 2 decubitus care, this intervention may signal a debilitated patient whom the agency or the patient's physician believes requires monitoring and perhaps some home health aide services. However, unlike venipuncture and stage 1 or 2 decubitus care, the Georgetown data offered no confirmation that this intervention is used for highly debilitated patients.

H. VARIATION IN PREDICTORS ACROSS DISCIPLINES

Based on the panel discussion, we developed four categories of patient characteristics that predict the presence of a treatment or the level of service received for a treatment: medical condition, orders for medications, other physical and financial conditions, and emotional and cognitive conditions. We also developed a fifth category of informal caregiver characteristics.

Specific disciplines were more likely to be affected by certain categories of measures:

- The use of ***therapy treatments*** (across all three therapy disciplines) is likely to be affected heavily by the ability of the patient to learn and adhere to a therapeutic plan of care. Thus, the patient's cognitive ability and level of compliance are particularly important predictors of the use and level of use of all types of therapy. However, it was suggested that limited cognitive ability and poor compliance could either increase or reduce the use of therapy--increasing use if the therapist needed to spend more time with the patient, and reducing use if the therapist or patient decided to pursue a more limited plan of care. In addition, the panel suggested that recent changes in functioning would be better predictors of therapy treatments, rather than point-in-time functioning measured at admission to home health. Finally, some specific diagnostic conditions (for example, osteoporosis, ataxic gait, and laryngectomy) were cited as increasing the likelihood of therapy treatment use.

- The use of ***medical social services*** is more likely to be predicted by the ability of the patient and informal caregiver to cope with the medical and social problems due to the patient's physical condition and financial management difficulties than by medical diagnoses and most other types of physical conditions.

- The use of ***home health aide services*** is likely to be predicted by the debilitation level of the patient and the availability and ability of an informal caregiver to assist with personal care or other activities. The panel suggested that caregiver burnout would also likely contribute to the use of aide services. In addition, the willingness of the patient and informal caregiver to accept the services of a home health aide is an important predictor of the use of aide services.

- By contrast, the use of ***skilled nursing treatments and interventions*** is relatively better predicted by the presence of orders for medication and physical conditions than are the other disciplines. In addition, the ability of an informal caregiver to carry out required treatments, such as urinary catheter care or wound care, or to be alert enough to monitor an infusion or an IV line will also affect the level of skilled nursing care required by a patient.

III. ADDITIONAL ISSUES RAISED BY THE PANEL

The panel raised five important points related to developing a prospective payment system for Medicare home health care but not strictly related to predicting the receipt of specific home health treatments or the level of such treatments. The first two pertain to the supply of home health professionals and thus the access of patients to care. The third point pertains to promoting independence among home health patients. The fourth point pertains to interpreting the effect of Medicare treatment codes on episode cost. The final point pertains to the changing nature of the home health industry and home health practice patterns.

A. THE SUPPLY OF HOME HEALTH PROFESSIONALS AND ACCESS TO CARE

The panel suggested that some groups of patients may not currently have access to physical and other therapies during a home health episode. In particular, panel members suggested that patients who reside in inner cities and in rural areas may never receive necessary therapy services (or may receive an inadequate level of service) due to the shortage of therapists available to work with the elderly Medicare population in these areas.

While the panel raised the general concern about increasing the supply of therapists trained to serve elderly patients, the question most relevant to case-mix adjustment is whether an adjustor based on extant data and data available in the near future will exacerbate access barriers because it does not provide an appropriate level of payment for patients who are currently unserved or underserved. If the databases on which the adjustor is based contain patients whose characteristics and care needs are comparable to those of unserved and underserved patients in inner cities and rural areas (except for their location), the case-mix adjustors developed from these databases will give agencies adequate resources to provide such care (if the professionals are available). However, because, for example, patients in inner cities and rural areas may be in poorer health (due likely to lower incomes) and thus

have different care needs, a case-mix adjustor that does not account for this poorer health status would not give sufficient resources to agencies to provide the necessary treatments.

Improving our understanding of the likely effect of using extant databases to construct case-mix adjustors on access to care requires a better understanding of the undersupply of therapy and the care needs of patients in unserved and underserved areas relative to those of patients in other types of communities.

B. THE SUPPLY OF HOME HEALTH PROFESSIONALS AND THE SUBSTITUTION OF CARE

The second point raised by the panel pertains to the substitution of care by one type of professional for another. In particular, the panel suggested that nurses will sometimes perform physical therapy treatments, especially if physical therapists are in short supply, and physical therapists will sometimes provide occupational therapy if occupational therapists are in short supply. Such substitution is most likely when only ***limited treatment*** is required from an alternative professional. For example, a physical therapist may substitute for an occupational therapist in teaching tub transfer, but a physical therapist would not teach patients independence in IADLs. The training, skills, and focus of nurses, PTs, and OTs are distinct and specialized, and thus a professional from one discipline cannot completely substitute for a professional from another discipline.

Given that some substitution prevails, an adjustor based on treatment provided by a particular professional may create incentives (under some circumstances) to involve less expensive professions in the case in order to increase the level of payment without benefiting the patient. The substitution of one discipline for another would not make a case-mix adjustor based on patient characteristics inaccurate, as long as the cost of the care required was comparable regardless of the profession involved. This seems to be the case at present. However, if in the future the relative cost of care provided by one profession changes, it could create incentives to use the less expensive profession. The relative cost of care might change if in the wages and wage-related costs for one profession

changed relative to another, or if patterns showed that one profession is beginning to provide more visits or longer visits to address the same care needs.

C. THE RECEIPT OF THERAPY IN HOME HEALTH TO PROMOTE INDEPENDENCE

The third point, also pertaining to the use of therapists, was a recommendation by the panel that any patient for whom a home health aide is provided should receive a physical or occupational therapy assessment early in the episode, if not prior to the first home health aide visit. The purpose of the assessment and subsequent therapy treatment is to promote the independence of the patient through therapy rather than to foster the dependence of the patient, which often occurs with the introduction of a home health aide.

D. TREATMENT CODES AND THE FOCUS OF HOME HEALTH TREATMENT

The fourth point raised by the panel was that skilled treatments, although necessary, may not adequately characterize the nature of the care required in certain cases and may create incentives for providing unnecessary care. Thus, a payment system based on treatment codes might sometimes inadequately reflect actual care needs, thus obscuring the true rationale for a payment level. For example, the treatment code for venipuncture may be the only skilled treatment coded for very debilitated patients with weak informal care systems who need frequent personal care from home health aides but relatively infrequent nursing visits to draw blood to monitor medications. (Patients who need only venipuncture and are not severely debilitated or have stronger informal support are likely to have this procedure performed in a physician's office or clinic.) The cost of an episode of care for such a patient would be substantial. However, since the venipuncture itself is relatively inexpensive, having a relatively large payment associated with venipuncture seems counter-intuitive. Moreover, a payment system based on treatment codes may inadvertently create incentives for providing unnecessary care. For example, an incontinent patient who needs home health aide services may get a catheter rather than incontinence training because services provided by a home health aide are likely to be covered for a longer period if the patient has a catheter.

In contrast, a case-mix adjustor based on a range of patient characteristics, including functional ability, emotional and cognitive status, and the availability and ability of informal caregiver, in addition to medical diagnoses, would provide a more straightforward, intuitively appealing payment system. In the previous example for venipuncture, such a payment system would focus on the patient's debilitated state and extensive need for personal care, rather than on his or her need for blood tests.

E. FLUX IN THE HOME HEALTH INDUSTRY

The final point raised by the panel was that the home health industry has been and continues to be in a state of flux. These changes are due partly to the 1989 revisions to the Medicare home health regulations that allow Medicare home health agencies to serve patients with chronic illness and to monitor self- and informal care, and thus to serve patients whose home care needs differ substantially from patients receiving limited-duration, postacute care. Practice patterns in the home health industry are also changing in response to changes in the type of technology available in the home (such as home infusion, which requires nurses with higher-level skills than nurses who have traditionally been in home care). Moreover, future changes in other parts of the health care system, such as changes to the Medicare DRG system or to nursing-home reimbursement, or changes in the use of hospice care, will also affect the home health industry.

A case-mix adjustor is inevitably based on a point-in-time snapshot of home care. However, home health practice patterns continue to evolve. The panel suggested that a method be developed to respond to changes in home health practice. In addition, in response to the supposition that Medicare home health will eventually serve a more frail, chronically ill population, the panel suggested examining home health use under the Medicaid program. Data for long-term-care-eligible participants in the national S/HMO demonstration might be applicable in this respect. Such examinations could be very valuable in furthering our understanding of the likely shifts in practice patterns and how they will affect home health resource use.

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APPENDIX A

FORMS, CODES, AND REGRESSION RESULTS

TABLE A.1

FORM APPROVED
OMB NO. 0938-0

Home Health Agency Prospective Payment Demonstration
PATIENT INTAKE DATA FORM

1. Patient Name (Last, First, MI) 2. Sex F ☐ 1 M ☐ 2

Provider Name

3. Agency Patient No. _

Provider No. _ _ - _ _ _ _

4. Patient Medicare No. _ _ _ _ _ _ _ _ _ _ _ _ _ _

11. Date of Start of Care *(month/day/year)* _ _ / _ _ / _ _

5. Patient Medicaid No. _ _ _ _ _ _ _ _ _ _ _ _ _ _

6. Date of Birth *(month/day/year)* _ _ / _ _ / 1 _ _ _

7. Pre-Admission Location *(Check one and indicate approximate length of stay, if known, as appropriate.)*

		DAYS
Home or Apartment	☐ 1	
Acute Care Hospital	☐ 2 →	_ _ _
Nursing Home or Rehab Hospital	☐ 3 →	_ _ _
Other	☐ 4	
Unknown	☐ 5	

8. Informal Care *(circle one for each item)*

	YES	NO
a. Current or potential caregiver(s) living in home	1	2
b. Current or potential visiting caregiver(s)	1	2

c. Likelihood that patient and/or caregiver(s) will take over treatment
Very likely ....1 Somewhat unlikely 3
Somewhat likely .....2 Very unlikely 4

d. Extent of personal care needs for which willing and able caregiver(s) available
Nearly All.....1 Most.....2 Some.....3 Few/None....4

9. Patient Compliance *(circle one)*

	YES	NO	DK
a. History of poor compliance	1	2	3
b. Refusal of some or all of the currently recommended home health care	1	2	

10. Medical Conditions

a. Check all that affect any current personal care or treatment needs *(including medication)*:

- Cancer ☐ 1
- COPD ☐ 2
- CVA
  - *within 6 weeks and compromised use of limb(s)* ☐ 3
  - *within 6 weeks w/o compromised use of limb(s)* ☐ 4
- Congestive Heart Failure (CHF)
  - Newly diagnosed or acute exacerbation within last 4 weeks ☐ 5
  - Other CHF affecting current care ☐ 6
- Decubitus Ulcer *(circle stage: 1 2 3 4)* ☐ 1
- Dehydration ☐ 2
- Diabetes ☐ 3
- Hemiplegia ☐ 4
- Hip fracture or replacement within last 4 weeks ☐ 5
- Hypertension ☐ 6
- Quadriplegia ☐ 1
- None of the above affecting current care ☐ 2

b. Is patient's clinical condition... *(circle one)*
Very unstable.......1 Largely stable.......3
Somewhat unstable...2 Stable.......4

c. Number of hospitalizations in last 6 months *(circle one)*
0 1 2 3 or more DK

12. Treatment Needs *(check all that apply)*

- a. Urinary Catheter Insertion/Care ☐
- b. Daily IV Injections/Infusion ☐
- c. Med Administration *(teaching)* ☐
- d. Nasogastric Feeding *(teaching or tube insertion)* ☐
- e. Parenteral Feeding *(teaching)* ☐
- f. Skilled Nurse Observation/Nurse Assessment ☐
- g. Suctioning ☐
- h. Therapeutic Exercises *(teaching)* ☐
- i. Tracheostomy Care *(adm/teaching)* ☐
- j. Other Ostomy Care *(teaching)* ☐
- k. Venipuncture ☐
- l. Ventilator ☐
- m. Wound Care
  - *Assessment and/or Dressing Change* ☐
  - *Soaking/Irrigation/Debridement* ☐
- n. None of the Above ☐

13. Personal Care

a. Activities of Daily Living *(circle one for each item; circle NA if activity is not performed by or for patient)*

	Independent ... Depend *(see instructions)*			
Eating/tube feeding	1	2	3	4
Transfer	1	2	3	4
Toileting/Elimination	1	2	3	4
Dressing	1	2	3	4
Bathing	1	2	3	4
Walking/Wheeling	1	2	3	4

b. Types of meals patient is willing and able to prepare without human assistance *(circle one)*:
Full.......1 Light/Reheat.......2 None.......3

	YES	NO
c. Patient requires constant supervision	1	2
d. Incontinent of urine at least once per day	1	2

14. Expected Outcome *(see instructions)*

- a. Expected to return to pre-episode functioning and health status ☐
- b. Partial rehabilitation/improvement expected ☐
- c. Rehabilitation/improvement not expected ☐
- d. Terminal illness *(within 3 months)* ☐

Form Completed By:

Date: _ _ / _ _ / _ _

INSTRUCTIONS FOR SELECTED ITEMS

Stage of Decubitus Ulcer (Item 10a)

If the patient has one or more decubitus ulcers, use the definitions below in specifying the stage or highest stage of the ulcer or ulcers.

1. Stage 1 A persistent area of skin redness *(without a break in the skin)* that does not disappear when pressure is relieved.

2. Stage 2 A partial thickness loss of skin layers *(involving epidermis and/or dermis)* that is superficial and presents clinically as an abrasion, blister, or shallow crater.

3. Stage 3 A full thickness of skin is lost, exposing the subcutaneous tissues, which presents clinically as deep crater with or without undermining adjacent tissue.

4. Stage 4 A full thickness of skin and subcutaneous tissue is lost, exposing muscle and/or bone.

Stability of Clinical Condition (Item 10b)

Use the codes to indicate your judgement about the stability of the patient's clinical condition. A patient's condition is considered unstable to the extent that it fluctuates or is associated with an unpredictable or uncertain disease progression. Even if a patient's condition is improving or declining, it is considered stable to the extent that the improvement or decline is steady or fairly predictable.

Activities of Daily Living (Item 13)

These items measure the amount of human assistance with Activities of Daily Living that the patient requires most of the time at admission to this episode to home health care. Use of adaptive equipment or appliances alone is not considered dependence in scoring these items. In general, the levels of dependence on human assistance are as follows:

1. Patient requires no human supervision and no human physical assistance.

2. Patient requires limited or intermittent supervision and/or minimal physical assistance. Limited or intermittent supervision includes supervision of only part of the activity *(e.g., reminders to initiate the activity)* or periodically throughout the performance of the activity *(e.g., periodic encouragement to eat during a meal)*.

3. Patient requires constant supervision throughout the performance of the activity and/or substantial human physical assistance. Patient can participate in performance of activity.

4. Patient cannot participate in the performance of the activity; others must perform the activity for him or her.

NA Not applicable. Activity is not performed by or for the patient. For example, a patient whose primary source of nutrition is parenteral feeding does not eat and is not tube fed should have "Eating/tube feeding" coded as "NA".

Three of the activities involve combinations of related activities: eating/tube feeding, toileting/elimination, and walking/wheeling. Patients who require tube feeding are to be scored on the basis of the assistance required from another person in conducting the tube feeding. Patients who have a catheter, nephrostomy tube, colostomy, or ileostomy are to be scored on the basis of the human assistance they require in caring for these applicances. Patients who are in wheelchairs are to be scored on the basis of the human assistance they require to move about their own homes in wheelchairs. For example, a patient who requires no human supervision and/or assistance to move about in his or her home in a wheelchair is to be coded as "1".

*U.S. GPO 1991-0 294-448

TABLE A.2

DIAGNOSTIC CARE GROUPS

Administration of Antibiotics
Aerosol Therapy
Care following Amputation
Care of Acute, Serious Respiratory Diseases
Care of Serious Cardiopulmonary Conditions
Care of Less Serious Cardiopulmonary Conditions
Care of Serious Cancers
Care associated with Benign Tumors and Limited Cancers
Care of Infectious, Contagious, and Parasitic Diseases
Care following Knee Surgery
Care following Hip Surgery
Care following Fracture or Paralysis of an Upper Limb
Care following Fracture or Paralysis of a Lower Limb
Care of the Cognitively Impaired
Care of Urinary Incontinence
Care of a Urinary Catheter and other Urinary Procedures
Care of Kidney Disease
Care of Bowel Incontinence
Care of Back Disorders
Care of Malnutrition, Dehydration and Electrolyte Imbalance
Care of Anemia
Care of Peripheral Vascular Disease
Care of Gastrointestinal Disorders
Care of Disorders of the Lymph and Blood Forming Tissues
Care following a Stroke
Care of Hypertension and Cerebrovascular Disease
Care of Acute Vascular Lesions and Aneurysms
Care of a Complicated Wound
Care of an Uncomplicated Wound
Care of Serious Neuromuscular and Degenerative Diseases
Care of Less Serious Neuromuscular and Degenerative Diseases
Care of Miscellaneous Symptoms and Injuries
Diabetic Care
Eye and Ear Care
Gastrostomy Care and Enteral Feeding
Medication Supervision
Monitoring following Head Injury or Head Surgery
Monitoring following Heart Surgery
Monitoring following Surgery on Blood Vessels
Monitoring following Other Serious Surgery
Monitoring following Lesser Procedures
Ostomy Care
Psychiatric Monitoring
Tracheostomy Care

TABLE A.3

COMORBIDITIES

Amputation of a Limb
Cancer
Congestive Heart Failure
Chronic Obstructive Pulmonary Disease
Dementia
Depression
Diabetes
End Stage Renal Disease and Chronic Renal Failure
Immune System Diseases
Malnutrition, Dehydration and Electrolyte Imbalance
Obesity
Neurological Diseases
Paralysis
Peripheral Vascular Disease

TABLE A.4

MEDICARE HOME HEALTH TREATMENT CODES

tially increase the time spent by the home health aide.

F15. Other (Specify Under Orders)—Includes other home health aide services in accordance with determination made by a registered professional nurse. Specified in Item 21 HCFA-485.

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EXHIBIT V

TREATMENT CODES FOR PROFESSIONAL SERVICES REQUIRED

Skilled Nursing

A1	Skilled Observation and Assessment (Inc. V.S., Response to Med., etc.)
A2	Foley Insertion
A3	Bladder Instillation
A4	Open Wound Care/Dressing
A5	Decubitus Care (Partial tissue loss with signs of infection or full thickness tissue loss etc.)
A6	Venipuncture
A7	Restorative Nursing
A8	Post Cataract Care
A9	Bowel/Bladder Training
A10	Chest Physio (Inc. Postural drainage)
A11	Adm. of Vitamin B/12
A12	Adm. Insulin
A13	Adm. Other IM/Subq.
A14	Adm. IV's/Clysis
A15	Teach Ostomy or Ileo conduit care
A16	Teach Nasogastric Feeding
A17	Reinsertion Nasogastric Feeding Tube
A18	Teach Gastrostomy Feeding
A19	Teach Parenteral Nutrition
A20	Teach Care of Trach
A21	Adm. Care of Trach
A22	Teach Inhalation Rx
A23	Adm. Inhalation Rx
A24	Teach Adm. of Injection
A25	Teach Diabetic Care
A26	Disimpaction/F.U. Enema
A27	Other (Spec. Under Orders)
A28	Wound Care/Dressing—Closed Incision/Suture Line
A29	Decubitus Care (Other than A5)
A30	Teaching Care of Any Indwelling Catheter
A31	Management and Evaluation of Patient Care Plan
A32	Teaching and Training (other) (Spec. Under Orders)

Physical Therapy

B1	Evaluation
B2	Therapeutic Exercise
B3	Transfer Training
B4	Home Program
B5	Gait Training
B6	Pulmonary Physical Therapy
B7	UltraSound
B8	ElectroTherapy
B9	Prosthetic Training
B10	Fabrication Temporary Devices
B11	Muscle Re-education
B12	Management and Evaluation of a Patient Care Plan
B13-14	Reserved
B15	Other (Specify Under Orders)

Speech Therapy

C1	Evaluation
C2	Voice Disorders Treatments
C3	Speech Articulation Disorders Treatments
C4	Dysphagia Treatments
C5	Language Disorders Treatments
C6	Aural Rehabilitation
C7	Reserved
C8	Nonoral Communications
C9	Other (Specify Under Orders)

Occupational Therapy

D1	Evaluation
D2	Independent Living/Daily Living Skills (ADL Training)
D3	Muscle re-education
D4	Reserved
D5	Perceptual Motor Training
D6	Fine Motor Coordination
D7	Neuro-developmental Treatment
D8	Sensory Treatment
D9	Orthotics/Splinting
D10	Adaptive Equipment (Fabrication and Training)
D11	Other (Specify Under Orders)

Medical Social Services

E1	Assessment of Social and Emotional Factors
E2	Counseling for Long Range Planning and Decision Making
E3	Community Resource Planning
E4	Short Term Therapy
E5	Reserved
E6	Other (Specify Under Orders)

Home Health Aide

Home Health Aide

F1	Tub/Shower Bath	F9	Reserved
F2	Partial/Complete Bed Bath	F10	Exercises
F3	Reserved	F11	Prepare Meal
F4	Personal Care	F12	Grocery Shop
F5	Reserved	F13	Wash Clothes
F6	Catheter Care	F14	Housekeeping
F7	Reserved	F15	Other (Spec. Under Orders)
F8	Assist with Ambulation		

EXHIBIT VI

ACCEPTABLE V CODES

V45.6	States following surgery of eye and adnexa
V45.81	Postsurgical status, aortacoronary bypass status
V45.89	Postsurgical status, presence of neuropacemaker or other electronic device
V46.0	Dependence on Aspirator
V46.1	Dependence on Respirator
V52.0	Fitting and adjustment of artificial arm
V52.1	Fitting and adjustment of artificial leg
V53.5	Fitting and adjustment of ileostomy or other intestinal appliance
V53.6	Fitting and adjustment urinary devices
V54.0	Orthopedic aftercare involving removal of internal fixation device
V54.8	Orthopedic aftercare kirschner wire, plaster cast, external splint, external fixation device or traction device
V55.1	Attention to Gastrostomy
V55.2	Attention to Ileostomy
V55.3	Attention to Colostomy
V55.4	Attention to Other Artificial Opening of Urinary Tract
V55.5	Attention to cystostomy
V55.6	Attention to other artificial opening of urinary tract
V58.3	Attention to surgical dressing and sutures
V58.4	Other aftercare following surgery

<u>Georgetown University</u>

<u>School of Nursing</u>

Home Health Care Classification Project

<u>NURSING INTERVENTIONS SCHEME</u>

February 27, 1990

<u>Prefix Action Codes:</u>

A - Assess
C - Care, Direct
R ~~M~~ - ~~Manager~~ Refer
T - Teach

<u>Intervention Codes:</u>

01. Abuse Control

02. Activity Care
- 02.0 Cardiac Rehabilitation
- 02.1 Energy Conservation

03. Allergic Reaction Care

04. Bladder Care
- 04.0 Bladder Training
- 04.1 Bladder Instillation

05. Body System Condition Care
- 05.0 Cardiopulmonary
- 05.1 Cardiovascular
- 05.2 Endocrine
- 05.3 Gastrointestinal
- 05.4 Genitourinary
- 05.5 Integumentary
- 05.6 Musculoskeletal
- 05.7 Neurological
- 05.8 Psychological
- 05.9 Other Body System Condition

06. Bowel Care
- 06.0 Bowel Training
- 06.1 Enema
- 06.2 Disimpaction

TABLE A.5 (continued)

07.		Catheter Care
	07.0	Catheter Insertion
	07.1	Catheter Irrigation
08.		Chemotherapy Care
09.		Communication Care
10.		Community Services
	10.0	Adult Day Care
	10.1	Hospice Care
	10.2	Meals on Wheels
	10.3	Other Community Service
11.		Compliance Analysis
	11.0	Diet/Fluids
	11.1	Medical Regime
	11.2	Medications
	11.3	Safety
	11.4	Treatment Modality
12.		Counseling Services
	12.0	Coping
	12.1	Stress Control
13.		Decubitus Care
	13.0	Stage 1
	13.1	Stage 2
	13.2	Stage 3
	13.3	Stage 4
14.		Diabetic Care
	14.0	Finger Stick
	14.1	Insulin Administration
	14.2	Prefill Insulin
	14.3	Reaction Control
15.		Dialysis Care
16.		Ear Care
	16.0	Hearing Aid Control
	16.1	Wax Removal
17.		Edema Control
18.		Emergency Care
19.		Emotional Support
	19.0	Spiritual Comfort
20.		Eye Care
	20.0	Cataract Care

TABLE A.5 (continued)

21.		Fluid Therapy
	21.0	Hydration Status
	21.1	Intake/ Output
22.		Foot Care
23.		Fracture Care
	23.0	Cast Care
	23.1	Immobilizer
24.		Gastrostomy/Nasogastric Tube Care
	24.0	Tube Insertion
	24.1	Tube Irrigation
25.	/	Infection Control
	25.0	Universal Precautions
26.		Infusion Care
	26.0	Intravenous
	26.1	Venous Catheter Care
27.		Injection Administration
	27.0	Vitamin B12
28.		Medication Administration
	28.0	Actions
	28.1	Prefill Preparation
	28.2	Side Effects
29.		Mental Health Care
	29.0	Mental Health History
	29.1	Mental Health Promotion
	29.2	Mental Health Screening
	29.3	Mental Health Treatment Modality
	29.4	Violence Control
30.		Mobility Therapy
	30.0	Ambulation
	30.1	Assistive Device
	30.2	Prosthetic Training
	30.3	Transfer
31.		Mouth Care
	31.0	Dentures
32.		Nursing Contact
	32.0	Bill of Rights
	32.1	Care Coordination
	32.2	RN Status Report

33. Nutrition Care
- 33.0 Enteral/ Parenteral Feeding
- 33.1 Feeding Technique
- 33.2 Regular Diet
- 33.3 Special Diet

34. Ostomy Care
- 34.0 Irrigation

35. Oxygen Therapy Care

36. Pacemaker Care

37. Pain Control
- 37.0 Comfort Care

38. Perineal Care

39. Personal Care
- 39.0 ADLs
- 39.1 Bedbound Care
- 39.2 IADLs

40. Physical Health Care
- 40.0 Examination
- 40.1 Health Promotion
- 40.2 History
- 40.3 Measurements
- 40.4 Specimen Analysis

41. Physican Contact
- 41.0 Medical Regime
- 41.1 MD Status Report

42. Professional/Ancillary Service
- 42.0 Home Health Aide
- 42.1 Medical Social Worker
- 42.2 Nurse Specialist
- 42.3 Occupational Therapist
- 42.4 Physical Therapist
- 42.5 Speech Therapist
- 42.6 Other Caregiver
- 42.7 Other Professional

43. Psychosocial Analysis
- 43.0 Home Situation
- 43.1 Interpersonal Dynamics

44. Radiation Therapy Care

45. Respiratory Care
- 45.0 Breathing Exercises
- 45.1 Chest Physiotheraphy
- 45.2 Inhalation Therapy

46. Restorative Care
- 46.0 Exercises

47. Safety Precautions
- 47.0 Environmental Hazard
- 47.1 Equipment Care

48. Sleep Pattern Control

49. Skin Care
- 49.0 Skin Breakdown Control

50. Specimen Collection
- 50.0 Blood
- 50.1 Stool
- 50.2 Urine
- 50.3 Other Specimen

51. Symptom Control

52. Terminal Care
- 52.0 Dying/ Death Measures
- 52.1 Funeral Arrangements

53. Tracheostomy Care

54. Vital Signs

55. Weight Control

56. Wound Care
- 56.0 Drainage Tube Care
- 56.1 Dressing Change
- 56.2 Incision Care

TABLE A.8

PARAMETER ESTIMATES FOR REGRESSION MODELS USING HOME HEALTH CARE COSTS AS THE DEPENDENT VARIABLE
(T-statistics in parentheses)

Independent Variables	Patient Characteristics Only	Nature of Care	Basic Model	Reduced Model (Stepwise)	Reduced Interacted Model (Stepwise)	Log Cost	Tobit
Comorbidities							
Cancer	-13.3 (-0.29)	-17.8 (-0.42)	-5.2 (-0.13)			-0.032 (-0.81)	-8.5 (-0.21)
Congestive Heart Failure	43.8 (0.96)	69.7 (1.66)	61.5 (1.52)	66.0 (1.71)		0.067 (1.45)	64.2 (1.59)
Chronic Obstructive Pulmonary Disease	62.1 (1.43)	63.2 (1.62)	46.1 (1.21)		62.1 (1.60)	0.056 (1.48)	47.1 (1.24)
Dementia	-192.5 (-1.86)	-28.6 (-0.29)	-30.3 (-0.34)			-0.078 (-0.87)	-32.8 (-0.36)
Diabetes	69.9 (1.91)	-66.9 (-1.82)	-65.7 (-1.77)	-51.2 (-1.50)	-49.8 (-1.51)	-0.037 (-1.02)	-61.7 (-1.66)
Amputation	839.0 (2.26)	716.2 (3.37)	706.1 (3.41)	723.0 (3.53)	848.1 (4.31)	0.432 (2.15)	717.7 (3.46)
Neurological Disease	87.1 (1.31)	70.2 (1.18)	67.7 (1.16)			0.053 (0.94)	69.4 (1.19)
Peripheral Vascular Disease	163.5 (2.50)	133.5 (2.30)	142.4 (2.50)	134.6 (2.39)	123.2 (2.27)	0.091 (1.69)	146.8 (2.59)
End Stage Renal Disease	-3.5 (-0.04)	1.0 (0.01)	-4.8 (-0.04)			0.071 (0.58)	1.8 (0.01)
End Stage Renal Disease * Aide					416.8 (1.94)		
Malnutrition/Dehydration	-6.7 (-0.13)	-16.9 (-0.36)	-25.5 (-0.55)			-0.009 (-0.20)	-25.1 (-0.54)
Depression	107.1 (3.18)	30.8 (1.02)	5.0 (0.17)			0.008 (0.26)	4.1 (0.14)
Incontinence	246.6 (3.29)	140.0 (2.06)	139.1 (2.09)	126.8 (1.97)		0.135 (2.10)	142.1 (2.14)
Incontinence * (Aide and Therapy)					447.8 (3.39)		
Paralysis	84.9 (1.78)	22.9 (0.47)	15.2 (0.32)			-0.019 (-0.42)	11.4 (0.24)
Slow Wound Healer	224.4 (2.85)	166.7 (2.06)	164.0 (2.09)	166.7 (2.46)	161.8 (2.46)	0.095 (1.33)	152.1 (2.07)
Care Groups							
Eye and Ear Care	-145.1 (-1.43)	-148.7 (-1.86)	-140.1 (-1.86)	-122.4 (-1.46)		-0.226 (-2.64)	-153.3 (-1.73)
Knee Surgery	172.8 (1.87)	61.1 (0.58)	54.1 (0.59)			0.160 (1.81)	50.0 (0.55)
Hip Surgery	91.4 (1.30)	-39.4 (-0.46)	-36.0 (-0.56)			-0.061 (-1.01)	-43.5 (-0.60)
Ostomy Care	118.8 (1.28)	106.1 (1.33)	110.9 (1.39)		134.7 (1.83)	0.140 (1.82)	104.8 (1.31)
Amputation	287.9 (2.92)	179.1 (1.94)	180.2 (2.00)	186.4 (2.12)	233.9 (2.78)	0.110 (1.28)	162.8 (1.80)

TABLE A.6 (continued)

Independent Variables	Patient Characteristics Only	Nature of Care	Basic Model	Reduced Model (Stepwise)	Reduced Interacted Model (Stepwise)	Log Cost	Tobit
Tracheostomy	23.0 (0.13)	39.7 (0.22)	-4.5 (-0.03)			-0.041 (-0.24)	1.3 (0.01)
Diabetic Care	3.0 (0.04)	-65.8 (-0.91)	-61.4 (-0.86)			0.051 (0.74)	-60.3 (-0.85)
Diabetic Care * (Aide and Therapy)					-595.8 (-2.94)		
Aerosol Therapy	-74.0 (-0.85)	84.8 (1.07)	[illegible] (1.15)			0.081 (1.09)	84.0 (1.09)
Aerosol Therapy * Aide					259.1 (2.37)		
Cardiopulmonary: Less Serious	-18.6 (-0.21)	75.0 (1.08)	54.1 (0.80)			0.003 (0.05)	47.4 (0.70)
Monitoring Serious Surgery	39.6 (0.82)	23.2 (0.60)	5.3 (0.14)			-0.033 (-0.89)	3.5 (0.09)
Monitoring Serious Surgery * (Aide and Therapy)					-300.2 (-2.23)		
Monitoring Heart Surgery	-69.5 (-1.01)	-108.7 (-1.73)	-110.8 (-1.84)	-100.4 (-1.77)		-0.081 (-1.38)	-106.0 (-1.76)
Monitoring Lesser Procedures	141.5 (2.29)	121.0 (2.20)	98.5 (1.83)	82.4 (1.79)	117.1 (2.31)	0.088 (1.69)	100.1 (1.86)
Enteral Feeding/Gastrostomy	114.3 (0.59)	-160.4 (-0.97)	-162.2 (-1.00)		-342.8 (-1.98)	-0.084 (-0.54)	-142.8 (-0.88)
Enteral Feeding/Gastrostomy * Aide					787.9 (2.83)		
Infectious, Contagious and Parasitic Disease	298.8 (1.55)	145.5 (0.94)	22.8 (0.15)			-0.065 (-0.44)	-6.4 (-0.04)
Cardiopulmonary Serious	-117.5 (-1.85)	-3.0 (-0.05)	-2.7 (-0.05)			0.002 (0.04)	-11.7 (-0.21)
Cardiopulmonary Serious * Therapy					236.4 (1.85)		
Medication Supervision	-178.8 (-0.71)	36.1 (0.16)	13.8 (0.06)			0.107 (0.51)	13.0 (0.06)
Fracture/Paralysis: Upper Limb	287.8 (1.86)	80.4 (0.63)	62.7 (0.50)			-0.147 (-1.21)	21.0 (0.17)
Fracture/Paralysis Upper Limb * Therapy					782.3 (2.43)		
Fracture/Paralysis Lower Limb	158.8 (1.83)	38.9 (0.52)	28.9 (0.41)			0.024 (0.36)	26.2 (0.36)
Cancer: Serious	-44.0 (-0.70)	9.3 (0.16)	6.7 (0.12)			-0.014 (-0.26)	-4.2 (-0.07)
Cancer: Serious * Aide					106.8 (1.86)		
Benign Tumor/Limited Cancers	-132.8 (-0.80)	-87.8 (-0.60)	-100.3 (-0.69)			-0.102 (-0.73)	-120.2 (-0.83)
Psychiatric Monitoring	-139.2 (-0.72)	189.5 (1.16)	259.0 (1.63)	283.8 (1.84)	244.0 (1.56)	0.228 (1.40)	240.8 (1.42)
Cognitively Impaired	-344.5 (-0.90)	-78.4 (-0.33)	-24.7 (-0.10)			-0.201 (-0.87)	-17.0 (-0.07)

TABLE A.6 (continued)

Independent Variables	Patient Characteristics Only	Nature of Care	Basic Model	Reduced Model (Stepwise)	Reduced Interacted Model (Stepwise)	Log Cost	Tobit
Urinary Incontinence	-103.9	19.0	44.4			0.020	42.6
	(-1.19)	(0.24)	(0.56)			(0.26)	(0.54)
Urinary Incontinence * (Aide and Therapy)					713.0		
					(3.57)		
Urinary Catheter/Procedures	44.3	-37.2	-36.4		-197.5	-0.148	-41.0
	(0.32)	(-0.30)	(-0.30)		(-1.54)	(-1.27)	(-0.34)
Urinary Catheter * Aide					833.3		
					(3.22)		
Kidney Disease	-107.8	-38.7	-59.7			-0.160	-71.4
	(-0.84)	(-0.28)	(-0.40)			(-1.12)	(-0.48)
Bowel Incontinence	-393.2	-157.9	-134.7			-0.344	-169.2
	(-3.46)	(-1.56)	(-1.36)			(-3.59)	(-1.70)
Wound--Not Complicated	137.8	41.1	58.3			0.091	56.3
	(1.73)	(0.57)	(0.83)			(1.33)	(0.80)
Wound--Complicated	268.0	240.9	251.8	256.1	156.5	0.219	250.7
	(3.68)	(3.62)	(3.87)	(5.00)	(2.72)	(3.48)	(3.85)
Wound Complicated * Aide					250.7		
					(2.47)		
Wound Complicated * Therapy					517.8		
					(2.96)		
Acute Serious Respiratory Disease	-87.9	41.5	32.8			-0.010	20.6
	(-0.97)	(0.51)	(0.41)			(-0.12)	(0.26)
Neuromuscular/Degenerative: Serious	-175.2	-248.2	-230.5	-239.2	-174.8	-0.090	-230.9
	(-1.39)	(-2.11)	(-2.02)	(-2.29)	(-1.73)	(-0.82)	(-2.03)
Neuromuscular/Skeletal: Less Serious	8.7	-58.3	-61.0			-0.074	-66.7
	(0.11)	(-0.86)	(-0.92)			(-1.15)	(-1.00)
Head Injury/Surgery	619.7	305.3	286.1			0.221	289.9
	(2.38)	(1.32)	(1.26)			(1.01)	(1.28)
Back Disorders	-23.0	-89.0	-104.1			-0.140	-119.0
	(-0.28)	(-1.11)	(-1.33)			(-1.84)	(-1.51)
Back Disorders * Therapy					-220.8		
					(-1.87)		
Malnutrition/Dehydration/Electrolyte	-147.8	-98.4	-68.2			-0.094	-82.7
	(-1.40)	(-1.04)	(-0.73)			(-1.06)	(-0.89)
Antibiotics	195.7	81.5	27.4			0.079	27.4
	(1.11)	(0.55)	(0.16)			(0.53)	(0.16)
Anemias	-186.6	-140.7	-185.3	-179.2		-0.264	-206.0
	(-1.34)	(-1.13)	(-1.46)	(-1.60)		(-2.15)	(-1.64)
Lymph/Blood Forming Tissues	-10.5	-23.6	-32.6			-0.077	-44.3
	(-0.07)	(-0.19)	(-0.26)			(-0.64)	(-0.36)
Stroke	417.4	166.6	152.2	167.3	186.7	0.106	145.7
	(5.29)	(2.26)	(2.13)	(3.30)	(3.29)	(1.57)	(2.06)
Hypertension/Cerebrovascular Disease	-59.6	53.6	65.5			0.031	59.6
	(-0.71)	(0.71)	(0.89)			(0.44)	(0.81)
Acute Vascular Lesions/Aneurysms	-43.5	16.1	4.1			0.027	-0.8
	(-0.41)	(0.17)	(0.04)			(0.30)	(-0.01)
Surgery on Blood Vessels	30.6	-111.1	-136.1	-125.8	-90.2	-0.131	-149.7
	(0.40)	(-1.82)	(-2.08)	(-1.97)	(-1.47)	(-2.01)	(-2.23)

TABLE A.8 (continued)

Independent Variables	Patient Characteristics Only	Nature of Care	Basic Model	Reduced Model (Stepwise)	Reduced Interacted Model (Stepwise)	Log Cost	Tobit
Peripheral Vascular Disease	142.4	136.4	147.7	148.8	193.0	0.018	144.2
	(1.21)	(1.29)	(1.44)	(1.57)	(2.14)	(0.15)	(1.41)
Gastrointestinal Disorders	-187.8	-121.7	-132.1	-117.1	-113.9	-0.148	-147.9
	(-2.13)	(-1.58)	(-1.72)	(-1.85)	(-1.85)	(-1.98)	(-1.92)
Miscellaneous Symptoms/Injuries	-62.8	-81.3	-75.2			-0.088	-82.2
	(-0.88)	(-1.18)	(-1.06)			(-1.31)	(-1.33)
Equipment and Supplies							
Adult Diapers	189.7	81.7	89.4	84.7		0.067	90.1
	(4.58)	(2.19)	(2.44)	(2.37)		(1.89)	(2.48)
Adult Diapers * Aide					134.8		
					(2.42)		
Enema, Bowel Kits	248.1	189.2	134.0	131.8		0.147	138.8
	(4.88)	(3.38)	(2.73)	(2.98)		(3.10)	(2.84)
Enema, Bowel Kits * (Aide and Therapy)					381.4		
					(3.85)		
Respiratory Equipment	-97.8	-128.2	-128.1	-102.3		-0.108	-130.8
	(-2.19)	(-3.08)	(-3.13)	(-2.77)		(-2.78)	(-3.25)
Respiratory Equipment * Aide					-145.8		
					(-2.31)		
Uses Either Cane or Crutches	56.5	50.8	47.5	51.5	57.4	0.080	54.0
	(1.78)	(1.80)	(1.72)	(1.90)	(2.20)	(2.25)	(1.95)
Wheel Chair	125.2	62.7	61.0	60.9		0.049	65.7
	(3.59)	(2.00)	(1.98)	(2.08)		(1.65)	(2.17)
Sensory, Cognitive, and Other Limitations							
Ambulation	145.8	64.8	61.5	59.9	43.2	0.097	66.7
	(4.24)	(2.11)	(2.04)	(2.07)	(1.54)	(3.34)	(2.21)
Ambulation * Therapy					144.7		
					(2.47)		
Comatose	-367.2	-265.3	-166.2			-0.263	-173.7
	(-1.91)	(-1.57)	(-1.00)			(-1.64)	(-1.04)
Hearing	59.2	3.7	3.3			0.013	4.9
	(2.00)	(0.14)	(0.13)			(0.52)	(0.19)
Speech	115.2	19.1	9.9			0.003	6.7
	(2.48)	(0.44)	(0.23)			(0.07)	(0.16)
Comprehension Difficulty	28.2	4.7	18.8			0.028	16.5
	(0.77)	(0.14)	(0.52)			(0.84)	(0.51)
Communication Difficulty	-183.8	-93.8	-57.6	-84.8	-62.6	-0.027	-54.3
	(-3.48)	(-2.25)	(-1.40)	(-1.73)	(-1.53)	(-0.67)	(-1.32)
Communication Difficulty * Therapy					190.3		
					(2.08)		
Communication Difficulty * (Aide and Therapy)					-185.3		
					(-1.86)		
Legally Blind	130.8	128.0	108.9	109.6	91.1	0.082	109.8
	(3.22)	(3.88)	(3.08)	(3.15)	(2.72)	(1.79)	(3.09)
Activities of Daily Living							
Dependent in Bathing	80.7	-36.5	-45.9			0.012	-58.9
	(1.89)	(-0.98)	(-1.20)			(0.33)	(-1.54)

TABLE A.8 (continued)

Independent Variables	Patient Characteristics Only	Nature of Care	Basic Model	Reduced Model (Stepwise)	Reduced Interacted Model (Stepwise)	Log Cost	Tobit
Dependent in Bathing * Aide					-336.0 (-2.56)		
Dependent in Dressing	129.9 (3.06)	63.8 (1.68)	70.0 (1.90)			0.059 (1.66)	71.7 (1.94)
Dependent in Dressing * Aide					183.8 (2.86)		
Dependent in Dressing * (Aide and Therapy)					193.8 (2.05)		
Dependent in Feeding	-60.9 (-1.71)	-87.2 (-2.70)	-17.2 (-0.53)			-0.040 (-1.26)	-19.1 (-0.59)
Dependent in Medications	-7.8 (-0.26)	4.7 (0.17)	-18.8 (-0.61)			-0.043 (-1.63)	-15.8 (-0.58)
Dependent in Toileting	-0.4 (-0.01)	-30.9 (-0.92)	-28.8 (-0.87)			-0.018 (-0.57)	-23.9 (-0.72)
Dependent in Transferring	65.8 (1.82)	2.3 (0.07)	16.0 (0.51)			0.004 (0.13)	13.0 (0.41)
Severity of Illness Measures							
Discharged from Hospital < 14 Days Prior to Home Health	87.1 (3.07)	39.8 (1.56)	13.8 (0.56)			0.040 (1.68)	18.8 (0.79)
Discharged from SNH < 14 Days Prior to Home Health	288.6 (4.36)	68.8 (1.24)	71.4 (1.31)			0.023 (0.43)	75.0 (1.38)
Number of Home Health Visits 6 Months Prior to Home Health	6.4 (6.40)	4.1 (4.81)	4.3 (4.90)	4.4 (5.11)	4.1 (4.87)	0.004 (4.88)	4.3 (4.91)
Number of Hospital Admissions During Home Health Episode			184.6 (9.96)	187.4 (10.32)	173.5 (9.42)	0.206 (11.64)	187.8 (10.17)
Number of Hospital Admissions During Home Health Episode * (Aide and Therapy)					113.0 (1.96)		
Treatments--Skilled Nursing							
Foley Insertion		78.3 (1.39)	58.0 (1.03)	78.2 (1.65)		0.006 (0.15)	48.2 (0.88)
Bladder Instillation		264.7 (2.96)	258.6 (2.88)	260.8 (2.96)	306.8 (3.70)	0.321 (3.64)	267.9 (2.86)
Open Wound Care/Dressing		485.8 (14.79)	462.9 (14.37)	469.9 (15.58)	566.5 (15.02)	0.445 (14.28)	465.1 (14.45)
Open Wound * Aide					-186.8 (-2.76)		
Open Wound * Therapy					-234.0 (-2.14)		
Open Wound * (Aide and Therapy)					-294.1 (-3.08)		
Decubitus Care--Stage 3, 4, 5		175.7 (2.95)	167.8 (2.87)	172.5 (3.00)	167.8 (2.46)	0.207 (3.66)	177.3 (3.03)
Decubitus Care--Stage 3, 4, 5 * Aide					266.8 (2.34)		
Venipuncture		305.9 (10.86)	268.8 (9.53)	266.5 (9.96)	134.3 (3.72)	0.268 (9.92)	270.9 (9.79)
Venipuncture * Aide					256.4 (4.26)		

TABLE A.8 (continued)

Independent Variables	Patient Characteristics Only	Nature of Care	Basic Model	Reduced Model (Stepwise)	Reduced Interacted Model (Stepwise)	Log Cost	Tobit
Venipuncture * Therapy					230.2 (2.86)		
Venipuncture * (Aide and Therapy)					344.3 (4.24)		
Restorative Nursing		31.8 (1.31)	18.0 (0.67)			0.064 (2.33)	18.3 (0.77)
Restorative Nursing * (Aide and Therapy)					194.8 (3.24)		
Bowel/Bladder Training		-32.9 (-0.80)	-49.5 (-1.22)			-0.032 (-0.81)	-46.5 (-1.15)
Adm. of Vitamin B-12		289.7 (2.61)	327.2 (3.01)	344.8 (3.20)		0.367 (3.88)	323.2 (2.97)
Adm. of Vitamin B-12 * Aide					491.4 (3.16)		
Adm. of Vitamin B-12 * (Aide and Therapy)					428.4 (1.95)		
Adm. Other IM/Subq		208.7 (2.68)	179.0 (2.36)	154.7 (2.06)	187.5 (2.44)	0.140 (1.89)	178.7 (2.34)
Adm. of Other IM/Subq					-390.1 (-1.74)		
Teach Gastrostomy Feeding		412.0 (3.18)	361.2 (2.77)	281.2 (2.54)	307.9 (2.57)	0.279 (2.27)	343.9 (2.71)
Teach Care of Tracheostomy		-47.9 (-0.29)	-79.9 (-0.48)			0.048 (0.30)	-72.0 (-0.43)
Teach Diabetic Care		229.3 (5.18)	216.7 (5.00)	193.1 (5.48)	229.5 (6.44)	0.177 (4.22)	212.0 (4.90)
Teach Diabetic Care * Therapy					-209.5 (-2.16)		
Decubitus Care-Stage 1, 2		137.0 (2.59)	146.0 (2.82)	149.7 (2.94)	181.4 (3.30)	0.156 (3.11)	151.1 (2.92)
<u>Treatment--Therapy</u>							
Any Physical Therapy (PT)		157.0 (2.59)	118.8 (1.96)	118.7 (2.02)		0.200 (3.46)	114.3 (1.92)
Any PT Care * (Aide and Therapy)					-261.7 (-2.66)		
PT Therapeutic Exercise		288.0 (4.34)	294.3 (4.68)	287.4 (4.84)	271.7 (5.57)	0.267 (4.56)	293.1 (4.84)
PT Transfer Training		80.7 (1.57)	72.2 (1.43)	73.5 (1.48)		0.036 (0.74)	70.4 (1.40)
PT Prosthetic Training		123.6 (0.90)	149.4 (1.11)			0.192 (1.45)	154.7 (1.15)
Any Speech Therapy		425.4 (3.10)	395.8 (2.94)	378.5 (2.81)	202.4 (2.13)	0.282 (2.17)	392.7 (2.93)
Speech Therapy Evaluation Only		-578.3 (-2.03)	-487.9 (-1.79)	-493.2 (-1.85)		-0.327 (-1.22)	-494.8 (-1.78)
Speech Articulation Disorders		382.5 (2.17)	347.5 (2.13)	377.7 (2.34)		0.184 (1.04)	347.4 (2.13)
Speech Articulation Disorders * (Aide and Therapy)					927.2 (5.56)		

TABLE A.8 (continued)

Independent Variables	Patient Characteristics Only	Nature of Care	Basic Model	Reduced Model (Stepwise)	Reduced Interacted Model (Stepwise)	Log Cost	Tobit
Any Occupational Therapy		207.3 (2.79)	187.6 (2.58)	190.3 (2.65)		0.116 (1.83)	184.0 (2.53)
Muscle Re-Education		440.1 (4.06)	455.0 (4.30)	477.8 (4.56)	604.7 (7.38)	0.303 (2.96)	456.2 (4.32)
Any Social Work		85.2 (2.29)	84.8 (2.32)	84.3 (2.30)	92.0 (2.89)	0.164 (4.66)	89.7 (2.47)
Short Term Therapy with Social Worker		202.8 (2.48)	196.3 (2.45)	199.0 (2.52)	187.0 (2.44)	0.206 (2.67)	196.9 (2.45)
Treatment--Home Health Aide							
Any Home Aide		286.0 (6.89)	270.7 (6.85)	278.8 (7.09)		0.402 (10.20)	265.1 (7.01)
Partial/Complete Bed Bath		128.6 (3.22)	139.7 (3.24)	123.8 (3.24)		0.096 (2.56)	126.0 (3.23)
Bed Bath * (Aide and Therapy)					280.3 (4.19)		
Catheter Care		0.0 (0.00)	28.2 (0.39)			0.034 (0.49)	37.5 (0.52)
Assist with Ambulation		64.1 (1.89)	61.9 (1.86)	67.2 (1.83)	48.5 (1.47)	0.018 (0.41)	55.9 (1.50)
Exercises		167.2 (3.47)	155.0 (3.29)	158.2 (3.37)	96.5 (2.19)	0.045 (0.99)	150.5 (3.20)
Nursing Interventions							
Activity Care		-47.7 (-1.51)	-44.5 (-1.44)			-0.031 (-1.05)	-43.7 (-1.42)
Activity Care * (Aide and Therapy)					-133.5 (-1.82)		
Cardiopulmonary Condition		76.6 (3.01)	72.0 (2.88)	79.1 (3.41)	58.1 (2.47)	0.056 (2.33)	70.5 (2.82)
Cardiopulmonary * (Aide and Therapy)					179.8 (2.67)		
Other Condition		15.3 (0.63)	-7.3 (-0.31)			0.039 (1.68)	-7.5 (-0.32)
Other Bowel		44.4 (1.41)	33.8 (1.09)			0.033 (1.09)	34.9 (1.13)
Infusion Care		343.6 (4.82)	297.2 (4.34)	289.2 (4.32)	311.7 (4.86)	0.270 (4.07)	303.8 (4.44)
Mobility Therapy		5.1 (0.14)	1.3 (0.04)			-0.030 (-0.80)	1.0 (0.03)
Psychosocial Analysis		-60.1 (-1.84)	-67.3 (-1.08)			-0.028 (-0.54)	-54.3 (-1.01)
Respiratory Care		85.6 (2.14)	70.8 (1.81)	79.2 (2.09)		0.074 (1.95)	70.8 (1.81)
Vital Signs		112.2 (4.26)	103.7 (4.02)	99.8 (4.00)	99.2 (4.12)	0.081 (3.25)	107.9 (4.19)
Response to Care							
More Dependent			289.1 (4.77)	277.2 (5.16)	259.2 (4.89)	0.307 (5.63)	277.0 (4.90)

TABLE A.8 (continued)

Independent Variables	Patient Characteristics Only	Nature of Care	Basic Model	Reduced Model (Stepwise)	Reduced Interacted Model (Stepwise)	Log Cost	Tobit
Less Dependent			53.3	49.5	38.9	0.118	61.0
			(1.96)	(1.96)	(1.86)	(4.44)	(2.25)
Resolved			20.8	18.4		0.034	21.9
			(3.16)	(2.81)		(5.36)	(3.32)
Resolved * Aide					33.8		
					(2.85)		
Resolved * (Aide and Therapy)					37.9		
					(2.46)		
Improved			27.5	26.5	22.7	0.037	29.4
			(4.83)	(4.60)	(4.09)	(6.47)	(4.96)
No Change			-33.8	-36.3	-32.4	-0.057	-36.3
			(-3.81)	(-3.86)	(-3.67)	(-6.37)	(-4.07)
Stabilized			12.8			0.030	15.3
			(1.27)			(3.07)	(1.52)
Deteriorated			10.0			0.000	10.4
			(1.07)			(0.02)	(1.11)
No Change			-33.8	-36.3	-32.4	-0.057	-36.3
			(-3.81)	(-3.86)	(-3.67)	(-6.37)	(-4.07)
Artificially Shortened Episode - < 120 Days			-191.9	-194.4	-198.3	-0.225	-207.3
			(-8.66)	(-8.09)	(-8.45)	(-8.86)	(-8.08)
<u>Demographics and Informal Caregiving</u>							
Under 65 Years Old	-8.0	-60.7	-60.5			-0.012	-56.8
	(-0.13)	(-0.96)	(-1.16)			(-0.23)	(-1.09)
Between 75 and 85 Years Old	-75.2	-64.4	-63.8	-58.0	-34.2	-0.036	-64.1
	(-2.62)	(-2.52)	(-2.55)	(-2.37)	(-1.84)	(-1.46)	(-2.56)
Over 85 Years Old	-128.4	-100.3	-95.1	-95.8		-0.076	-103.2
	(-3.31)	(-2.90)	(-2.80)	(-2.76)		(-2.33)	(-3.04)
Over 85 Years Old * (Aide and Therapy)					-250.1		
					(-3.41)		
Female	27.8	13.9	12.3			0.022	15.4
	(1.04)	(0.56)	(0.53)			(0.97)	(0.66)
Medicaid	-50.9	-95.0	-108.8	-93.5		-0.060	-109.3
	(-0.97)	(-2.04)	(-2.33)	(-2.10)		(-1.36)	(-2.36)
Racial/Ethnic Minority	58.9	38.8	33.4			0.039	30.8
	(1.85)	(1.42)	(1.22)			(1.47)	(1.13)
Lives Alone	-2.0	23.2	37.4			0.018	35.5
	(-0.07)	(0.90)	(1.49)			(0.74)	(1.40)
<u>Missing Value Dummies</u>							
Missing Care Groups	-184.3	-107.0	-92.8			-0.143	-108.2
	(-1.78)	(-1.16)	(-1.03)			(-1.84)	(-1.20)
Missing ADLs at Admission	-87.0	-55.1	2.0			0.099	11.0
	(-1.28)	(-0.85)	(0.03)			(1.67)	(0.18)
Missing Treatments		398.3	340.4	311.9		0.204	334.5
		(2.47)	(2.25)	(2.07)		(1.36)	(2.15)
Missing Nursing Interventions		-41.5	-25.6			-0.012	-29.6
		(-0.63)	(-0.40)			(-0.19)	(-0.46)
Missing ADLs at End of Episode			63.9	57.6	69.2	0.042	65.1
			(1.83)	(1.70)	(2.09)	(1.24)	(1.96)

TABLE A.8 (continued)

Independent Variables	Patient Characteristics Only	Nature of Care	Basic Model	Reduced Model (Stepwise)	Reduced Interacted Model (Stepwise)	Log Cost	Tobit
Received Aide Care					436.1 (3.52)		
Received Aide and Therapeutic Care					508.7 (4.06)		
Intercept Parameter	418.8 (5.87	228.8 (3.37)	189.5 (2.83)	221.9 (6.10)	244.1 (7.12)	6.556 (85.88)	116.0 (1.72)
Standard Deviation of Tobit Equation							727.7 (97.53)
R^2	.1565	.3427	.3733	.3667	.4169	.4119	NA
$\bar{R}^2$	.1400	.3248	.3550	.3560	.4054	.3948	NA
Sample Size	4,862	4,862	4,862	4,862	4,862	4,862	4,862

NOTES: The patient characteristics only model includes only explanatory variables of the following types: comorbidities, diagnoses, equipment, limitations, dependent activities, severity measures, and demographics.

The care plan model includes all of the variables in the patient characteristics model, plus data from an initial care plan.

The basic model adds information from the end of the episode to that of the care plan model, including change in patient's number of ADL impairments and the number of intervening hospital stays.

The reduced model was developed using stepwise regression. All of the variables included in the basic model were eligible explanatory variables in the reduced model.

The reduced interacted model was also developed using stepwise regression. In this case, potential explanatory variables included the basic set plus the basic set interacted with binary variables indicating the skill mix of the care received.

The log costs model uses the same explanatory variables as the basic regression model but uses the natural logarithm of costs at 120 days as the dependent variable. The coefficients in this model are not directly comparable to those of the other models, given the different functional form. However, since the coefficients in the log model can be roughly interpreted as the expected percentage effect on cost of a one unit change in X, the coefficients from the log model can be compared to the basic regression coefficients divided by the sample mean of costs, $940.

The Tobit model uses the same variables as the basic regression model. Tobit coefficients are not normally comparable to OLS coefficients but because there are so few limit cases (about 2 percent of the sample), these values should be of comparable size.

NA indicates not available.

APPENDIX B

DRAFT QUESTIONS FOR FUTURE DATA COLLECTION

TABLE B.1

DRAFT QUESTIONS FOR ADDITIONAL DATA COLLECTION:
MEASURES OF OTHER MEDICAL CONDITIONS

Check List for Other Medical Conditions	Discipline/Treatment Cued by Condition
If not listed among primary or secondary diagnoses, does the patient have any of the following medical conditions that may affect home health care?	
Osteoporosis or osteoarthritis Hip fracture Joint replacement Spinal cord injury Compression fracture of the spine Parkinson's disease Generalized weakness Pain	PT/OT
Ataxic gait	PT
Myocardial infarction, congestive heart failure, or a recent cardiac procedure	PT/OT/Cardiopulmonary Conditioning
Chronic obstructive pulmonary disease Pneumonia, asthma, or acute or chronic bronchitis	Respiratory Care
Aspiration pneumonia	Gastrostomy Teaching
Osteomyelitis	Infusion Care
Laryngectomy Hearing problem requiring retraining for communication	ST
Swallowing problem/dysphagia Voice disorder A previously diagnosed stroke	ST Evaluation Only
Dysarthria Apraxia	ST Speech Articulation Disorder
Rheumatoid arthritis Sight impairment Alcohol abuse Anxiety	MSS
Decubitus ulcers Stage 1 or 2 Stage 3, 4, or 5	Aide, Decubitus Care
Interiginous, perineal or stasis dermatitis	Aide
Diabetes Newly diagnosed Old diagnosis	Diabetic Teaching
Incontinence	Decubitus Care
If cerebrovascular accident were listed among the primary or secondary diagnoses, did the CVA affect the left hemisphere of the brain?	PT/OT/ST
Is the patient's physician contemplating insertion of a nasogastric (or some other type of) feeding tube?	ST Evaluation Only

TABLE B.2

DRAFT QUESTIONS FOR ADDITIONAL DATA COLLECTION:
MEASURES OF ORDERS FOR MEDICATIONS

Check List for Medications	Discipline/Treatment Cued by Use of Medication
Does the patient have orders for any of the following medications?	
Anti-coagulants	Venipuncture
Other medications for heart conditions (digitalis and digitalis-related drugs)	Venipuncture
Antibiotics	Open Wound Care/Infusion Care
Chemotherapy	Administration of Other IM/Subq Injection/Infusion Care
Anti-emetics	Administration of Other IM/Subq Injection
Insulin	Venipuncture, Diabetic Teaching
Psychotropics	Administration of Other IM/Subq Injection
Pain control medication	Administration of Other IM/Subq Injection
Calcimar (or other medication for osteoporosis)	Administration of Other IM/Subq Injection
Vitamin B12	Administration of Vitamin B12 Injection
Other types of medication and vitamins (e.g., theophyllin, a bronchial dilator)	Administration of Other IM/Subq Injection
If the patient has orders for any of the above, how is each to be administered? Orally IM/Subq injection Infusion Other	Administration of Other IM/Subq Injection/Infusion Care

TABLE B.3

DRAFT QUESTIONS FOR ADDITIONAL DATA COLLECTION: MEASURES OF OTHER PHYSICAL/FINANCIAL CONDITIONS

Other Physical/Financial Conditions	Discipline/Treatment Cued by Condition
Has the patient experienced an increase in falling during the last 1 to 2 months?[a]	PT/OT
Has the patient's physician ordered new equipment or a change in equipment in the last month?	PT/OT/MSS
Has the patient experienced a change in ability to ambulate, dress or perform other ADLs during the last 1 to 2 months?	
Has the patient experienced a change in ability to perform IADLs during the last 1 to 2 months?	OT/MSS
How would you assess the ability of the patient to safely carry out needed activities in his or her home? Adequate, inadequate	OT
Speech and Swallowing Prognosis What is the expected level of communication for this patient: unassisted communication, assisted communication, limited communication, or assisted swallowing? What is the prognosis for the patient at the expected level of communication: excellent, good, fair, or poor?	ST
Has the patient experienced a change in eating habits during the last 2 to 3 months?	OT/MSS
Is the patient experiencing difficulty managing finances?	
Does the patient have limited funds, limited insurance, or need assistance gaining access to community resources?	MSS
Does the agency, the patient, or the informal caregiver perceive a need for conservatorship or guardianship arrangements?	
Is the patient bedbound or chairbound?	Aide/Bladder Instillation
Does the patient have a Foley catheter that has been left in place for more than three weeks?	Bladder Instillation
Does the patient have a wound with drain? Does the patient have an infected wound? Did the patient have a wound debrided in the prior hospital stay?	Open Wound Care
If the patient has a wound with a drain or an infected wound, is it located in a place which is difficult for self care or care by the informal caregiver?	
Does the patient have a central venous line?	Open Wound Care/Infusion Care
Does the patient need help turning or positioning in bed?	OT/Open Wound Care/Decubitus Care Stage 3-5/Aide
Does the patient use an egg-crate mattress?	Open Wound Care/Decubitus Care Stage 3-5/Aide
Does the patient use a Hoyer lift?	PT/OT/Open Wound Care/Decubitus Care Stage 3-5/Aide

TABLE B.3 (continued)

Other Physical/Financial Conditions	Discipline/Treatment Cued by Condition
How would you assess the nutritional status of the patient: adequate or better, or less than adequate?	Open Wound Care/Decubitus Care Stage 3-5/Aide
Is the patient expected to live 6 months or less?	Decubitus Care Stage 1-2/Venipuncture/ Vital Signs/Aide
Is nursing home placement being considered for the patient?	
How would you assess the level of debilitation of the patient? Severe, moderate, slight	
Can the patient travel to have blood drawn and is someone available to aid in travel if necessary?	Venipuncture
If the patient has diabetes: Does the patient have a new order for insulin? Has the patient had a change in the dosage, timing, or type of insulin prescribed? Has the patient been compliant with the dietary restrictions required for the care of diabetes? If the patient must self-inject insulin, has the patient had difficulty learning self-injection? Has the patient experienced a change in ability to self-inject?	Diabetic Teaching
Does the patient have orders for breathing exercises?	Cardiopulmonary Care/Respiratory Care
Is the patient clinically stable?	Infusion Care

[a]An increase in falling during a home health episode may also prompt a PT or OT evaluation.

TABLE B.4

DRAFT QUESTIONS FOR ADDITIONAL DATA COLLECTION:
MEASURES OF EMOTIONAL/COGNITIVE CONDITIONS

Emotional/Cognitive Conditions	Discipline/Condition Cued by Condition
Is the patient experiencing an adjustment reaction to a change in physical condition?	PT/OT/ST/MSS
How would you assess the patient's levels of general cooperativeness and compliance with his or her care plan?[a] Adequate, inadequate	
Does the patient seem motivated or willing to participate in his or her care plan?[a]	
Is the patient experiencing depression in conjunction with a recent stroke or amputation?	PT/OT/ST
How would you assess the patient's ability to cope with medical and social problems?[a] Adequate, inadequate	
Does the patient seem disoriented or confused?	
Is the patient able to carry out and retain instructions?	
Is the patient able to understand spoken, written, or gestured language?	
If the patient has some cognitive impairment, what is the source?	
Has the patient experienced a change in his or her willingness to get out of bed or leave the house during the last 2 to 3 months?	MSS
Has the patient recently experienced a traumatic loss, such as the death of a spouse or informal caregiver?	
Does the patient have difficulty making decisions?	
Has the patient experienced suicidal ideation during the last 2 to 3 months?	
Does the patient seem anxious, fearful, angry, or depressed?	
Does the patient seem to be vulnerable to abuse or neglect?	
Is the patient willing to accept personal care from the informal caregiver?	Aide
Is the patient (and informal caregiver) willing to accept the assistance of a home health aide if needed?	

[a]It was suggested that these questions are most usefully asked at least two weeks into the home health episode and possibly, at the conclusion of the episode.

TABLE B.5

DRAFT QUESTIONS FOR ADDITIONAL DATA COLLECTION: MEASURES OF INFORMAL CAREGIVER CHARACTERISTICS

Informal Caregiver Characteristics (Ask only if patient has a live-in or regularly visiting informal caregiver)	Discipline/Treatment Cued by Characteristic
Has the patient experienced a recent change in informal caregiver?	PT/OT/ST/Diabetic Teaching/Gastrostomy Teaching
How would you assess the ability of the informal caregiver to cope with the medical and social problems of the patient, particularly as this ability pertains to assisting the patient with a PT/OT/ST plan of care? Adequate, inadequate	PT/OT/ST
How would you assess the ability of the informal caregiver to cope with the medical and social problems of the patient as this ability would affect the recovering of the patient more generally? Adequate, inadequate	MSS
If a nursing home placement is being considered for the patient, how would you assess the ability of the informal caregiver to cope with this eventuality? Adequate, inadequate	
If the death of the patient is imminent, how would you assess the ability of the informal caregiver to cope with this eventuality? Adequate, inadequate	
Is the primary informal caregiver frail, disabled, or in poor health?	PT/OT/MSS/Aide
How many informal caregivers does the patient have?	Aide
Does the primary informal caregiver have other caregiving or employment responsibilities?	
Is the primary informal caregiver willing and able to provide personal care for the patient if needed?	
Is the primary informal caregiver willing and able to assist the patient with transfer if needed?	
During the last 3 months how many inpatient stays of 3 days or less has the patient had?	
During the last 3 months how many emergency room visits has the patient had?	

TABLE B.5 (continued)

Informal Caregiver Characteristics (Ask only if patient has a live-in or regularly visiting informal caregiver)	Discipline/Treatment Cued by Characteristic
If the patient has a catheter and requires assistance with its care, has the informal caregiver been able to learn to provide catheter care?	Bladder Instillation
If the patient has a draining or infected wound and requires assistance with its care, has the informal caregiver been able to learn to provide wound care?	Open Wound Care
If the patient has a decubitus ulcers and requires assistance with their care, has the informal caregiver been able to learn to provide decubitus care?	Decubitus Care Stage 1-2
If the patient needs vitamin B12 injections, has the informal caregiver been able to learn to administer the injections?	Vitamin B12
If the patient is fed by means of a gastrostomy tube, has the informal caregiver been able to learn to administer the feedings?	Gastrostomy Teaching
If the informal caregiver needs to administer insulin injections, has the informal caregiver been able to learn to administer the injections?	Diabetic Teaching
Has the caregiver experienced a change in ability to administer the injections?	
If the patient has orders for the infusion of medication, is the informal caregiver available and able to monitor the infusion and the status of the IV line?	Infusion Care

APPENDIX C

DRAFT QUESTIONS FOR FUTURE DATA COLLECTION ANNOTATED ACCORDING TO CURRENT PLANS FOR DATA COLLECTION

TABLE C.1

DRAFT QUESTIONS FOR ADDITIONAL DATA COLLECTION:
MEASURES OF OTHER MEDICAL CONDITIONS
ANNOTATED ACCORDING TO CURRENT PLANS FOR DATA COLLECTION

Check List for Other Medical Conditions	Discipline/ Treatment Cued by Condition	Current Data Collection Instrument (Measure)
If not listed among primary or secondary diagnoses, does the patient have any of the following medical conditions that may affect home health care?		
Osteoporosis or osteoarthritis Hip fracture Joint replacement Spinal cord injury Compession fracture of spine Parkinson's disease Generalized weakness Pain	PT/OT	PS (Any type of arthritis) PIDF (Hip fracture or replacement within last 4 weeks)
Ataxic gait	PT	
Myocardial infarction, congestive heart failure, or a recent cardiac procedure	PT/OT/Cardiopulmonary Conditioning	PIDF (CHF only)
Chronic obstructive pulmonary disease Pneumonia, asthma, or acute or chronic bronchitis	Respiratory Care	PIDF (COPD only) PS (Any chronic lung disease)
Aspiration pneumonia	Gastrostomy Teaching	
Osteomyelitis	Infusion Care	
Laryngectomy Hearing problem requiring retraining for communication	ST	
Swallowing problem/dysphagia Voice disorder	ST Evaluation Only	
A previously diagnosed stroke		PS (Ever had a stroke)
Dysarthria Apraxia	ST Speech Articulation Disorder	
Rheumatoid arthritis Sight impairment Alcohol abuse Anxiety	MSS	PS (Any type of arthritis)
Decubitus ulcers Stage 1 or 2 Stage 3, 4, or 5	Aide, Decubitus Care	PIDF (Decubiti and stages)
Interiginous, perineal or stasis dermatitis	Aide	
Diabetes Newly diagnosed Old diagnosis	Diabetic Teaching	PIDF (Diabetes without old/ new diagnosis distinction) PS (Diabetes with date of first diagnosis)
Incontinence	Decubitus Care	PIDF (Urinary incontinence at least once per day)

TABLE C.1 (continued)

Check List for Other Medical Conditions	Discipline/ Treatment Cued by Condition	Current Data Collection Instrument (Measure)
If cerebrovascular accident were listed among the primary or secondary diagnoses, did the CVA affect the left hemisphere of the brain?	PT/OT/ST	
Is the patient's physician comtempating insertion of a nasogastric (or some other type of) feeding tube?	ST Evaluation Only	

NOTE: PIDF stands for Patient Intake Data Form; PS stands for Patient Survey. A Patient Intake Data Form is filled out by the home health agency for each demonstration patient at admission to a demonstration home health agency. The Patient Survey was administered to a sample of demonstration patients approximately 3 weeks after admission to a demonstration home health agency.

TABLE C.2

DRAFT QUESTIONS FOR ADDITIONAL DATA COLLECTION:
MEASURES OF ORDERS FOR MEDICATIONS
ANNOTATED ACCORDING TO CURRENT PLANS FOR DATA COLLECTION

Check List for Medications	Discipline/Treatment Cued by Use of Medication	Current Data Collection Instrument (Measure)
Does the patient have orders for any of the following medications?		
Anti-coagulants	Venipuncture	PIDF (Treatment need for venipuncture)
Other medications for heart condition (digitalis and digitalis-related drugs)	Venipuncture	
Antibiotics	Open Wound Care/Infusion Care	
Chemotherapy	Administration of Other IM/Subq Injection/Infusion Care	
Anti-emetics	Administration of Other IM/Subq Injection	
Insulin	Venipuncture, Diabetic Teaching	PS (Whether taking insulin and who injects)
Psychotropics	Administration of Other IM/Subq Injection	
Pain control medication	Administration of Other IM/Subq Injection	
Calcimar (or other medication for osteoporosis)	Administration of Other IM/Subq Injection	
Vitamin B12	Administration of Vitamin B12 Injection	
Other types of medication and vitamins (e.g., theophyllin, a bronchial dilator)	Administration of Other IM/Subq Injection	
If the patient has orders for any of the above, how is each to be administered?	Administration of Other IM/Subq Injection/Infusion Care	PIDF (Treatment need for daily IV injection or infusion or for the teaching of medication administration)
Orally IM/Subq injection Infusion Other		

NOTE: PIDF stands for Patient Intake Data Form; PS stands for Patient Survey. A Patient Intake Data Form is filled out by the home health agency for each demonstration patient at admission to a demonstration home health agency. The Patient Survey was administered to a sample of demonstration patients approximately 3 weeks after admission to a demonstration home health agency.

TABLE C.3

DRAFT QUESTIONS FOR ADDITIONAL DATA COLLECTION: MEASURES OF OTHER PHYSICAL/FINANCIAL CONDITIONS ANNOTATED ACCORDING TO CURRENT PLANS FOR DATA COLLECTION

Other Physical/Financial Conditions	Discipline/Treatment Cued by Condition	Current Data Collection Instrument (Measure)
Has the patient experienced an increase in falling during the last 1 to 2 months?[a]	PT/OT	
Has the patient's physician ordered new equipment or a change in equipment in the last month?	PT/OT/MSS	
Has the patient experienced a change in ability to ambulate, dress or perform other ADLs during the last 1 to 2 months?		
Has the patient experienced a change in ability to perform IADLs during the last 1 to 2 months?	OT/MSS	
How would you assess the ability of the patient to safely carry out needed activities in his or her home? Adequate, inadequate	OT	
Speech and Swallowing Prognosis What is the expected level of communication for this patient: unassisted communication, assisted communication, limited communication, or assisted swallowing? What is the prognosis for the patient at the expected level of communication: excellent, good, fair, or poor?	ST	
Has the patient experienced a change in eating habits during the last 2 to 3 months?	OT/MSS	
Is the patient experiencing difficulty managing finances?		
Does the patient have limited funds, limited insurance, or need assistance gaining access to community resources?	MSS	PS (Able to afford prescription medications)
Does the agency, the patient, or the informal caregiver perceive a need for conservatorship or guardianship arrangements?		

TABLE C.3 (continued)

Other Physical/Financial Conditions	Discipline/Treatment Cued by Condition	Current Data Collection Instrument (Measure)
Is the patient bedbound or chairbound?	Aide/Bladder Instillation	PS (Bed- or chairbound)
Does the patient have a Foley catheter that has been left in place for more than three weeks?	Bladder Instillation	PS (Presence of indwelling catheter and time since initial insertion)
Does the patient have a wound with drain? Does the patient have an infected wound? Did the patient have a wound debrided in the prior hospital stay?	Open Wound Care	PIDF (Treament need for wound care)
If the patient has a wound with a drain or an infected wound, is it located in a place which is difficult for self care or care by the informal caregiver?		
Does the patient have a central venous line?	Open Wound Care/Infusion Care	
Does the patient need help turning or positioning in bed?	OT/Open Wound Care/Decubitus Care Stage 3-5/Aide	PS (Requires help turning in bed)
Does the patient use an egg-crate mattress?	Open Wound Care/Decubitus Care Stage 3-5/Aide	
Does the patient use a Hoyer lift?	PT/OT/Open Wound Care/Decubitus Care Stage 3-5/Aide	
How would you assess the nutritional status of the patient: adequate or better, or less than adequate?	Open Wound Care/Decubitus Care Stage 3-5	
Is the patient expected to live 6 months or less?	Decubitus Care Stage 1-2/Venipuncture/ Vital Signs/Aide	PIDF (Expected outcome of 3 or fewer months to live)
Is nursing home placement being considered for the patient?		PS (On nursing home waiting list)
How would you assess the level of debilitation of the patient? Severe, moderate, slight		
Can the patient travel to have blood drawn and is someone available to aid in travel if necessary?	Venipuncture	

TABLE C.3 (continued)

Other Physical/Financial Conditions	Discipline/Treatment Cued by Condition	Current Data Collection Instrument (Measure)
If the patient has diabetes: Does the patient have a new order for insulin? Has the patient had a change in the dosage, timing, or type of insulin prescribed? Has the patient been compliant with the dietary restrictions required for the care of diabetes? If the patient must self-inject insulin, has the patient had difficulty learning self-injection? Has the patient experienced a change in ability to self-inject?	Diabetic Teaching	
Does the patient have orders for breathing exercises?	Cardiopulmonary Care/Respiratory Care	
Is the patient clinically stable?	Infusion Care	PIDF (Clinical condition)

NOTE: PIDF stands for Patient Intake Data Form; PS stands for Patient Survey. A Patient Intake Data Form is filled out by the home health agency for each demonstration patient at admission to a demonstration home health agency. The Patient Survey was administered to a sample of demonstration patients approximately 3 weeks after admission to a demonstration home health agency.

[a]An increase in falling during a home health episode may also prompt a PT or OT evaluation.

TABLE C.4

DRAFT QUESTIONS FOR ADDITIONAL DATA COLLECTION:
MEASURES OF EMOTIONAL/COGNITIVE CONDITIONS
ANNOTATED ACCORDING TO CURRENT PLANS FOR DATA COLLECTION

Emotional/Cognitive Conditions	Discipline/Condition Cued by Condition	Current Data Collection Instrument (Measure)
Is the patient experiencing an adjustment reaction to a change in physical condition?	PT/OT/ST/MSS	
How would you assess the patient's levels of general cooperativeness and compliance with his or her care plan?[a] Adequate, inadequate		PIDF (Compliance history and acceptance of current care plan)
Does the patient seem motivated or willing to participate in his or her care plan?[a]		
Is the patient experiencing depression in conjunction with a recent stroke or amputation?	PT/OT/ST	
How would you assess the patient's ability to cope with medical and social problems?[a] Adequate, inadequate		
Does the patient seem disoriented or confused?		PIDF (Requires constant supervision)
Is the patient able to carry out and retain instructions?		
Is the patient able to understand spoken, written, or gestured language?		
If the patient has some cognitive impairment, what is the source?		
Has the patient experienced a change in his or her willingness to get out of bed or leave the house during the last 2 to 3 months?	MSS	
Has the patient recently experienced a traumatic loss, such as the death of a spouse or informal caregiver?		PS (Close family member or friend died in last six months or currently suffering from serious illness)
Does the patient have difficulty making decisions?		
Has the patient experienced suicidal ideation during the last 2 to 3 months?		
Does the patient seem anxious, fearful, angry, or depressed?	Aide	
Does the patient seem to be vulnerable to abuse or neglect?		

TABLE C.4 (continued)

NOTE: PIDF stands for Patient Intake Data Form; PS stands for Patient Survey. A Patient Intake Data Form is filled out by the home health agency for each demonstration patient at admission to a demonstration home health agency. The Patient Survey was administered to a sample of demonstration patients approximately 3 weeks after admission to a demonstration home health agency.

[a]It was suggested that these questions are most usefully asked at least two weeks into the home health episode and possibly, at the conclusion of the episode.

TABLE C.5

DRAFT QUESTIONS FOR ADDITIONAL DATA COLLECTION:
MEASURES OF INFORMAL CAREGIVER CHARACTERISTICS
ANNOTATED ACCORDING TO CURRENT PLANS FOR DATA COLLECTION

Informal Caregiver Characteristics (Ask only if patient has a live-in or regularly visiting informal caregiver)	Discipline/Treatment Cued by Characteristic	Current Data Collection Instrument (Measure)
Has the patient experienced a recent change in informal caregiver?	PT/OT/ST/Diabetic Teaching/Gastrostomy Teaching	
How would you assess the ability of the informal caregiver to cope with the medical and social problems of the patient, particularly as this ability pertains to assisting the patient with a PT/OT/ST plan of care? Adequate, inadequate	PT/OT/ST	
How would you assess the ability of the informal caregiver to cope with the medical and social problems of the patient as this ability would affect the recovering of the patient more generally? Adequate, inadequate	MSS	
If a nursing home placement is being considered for the patient, how would you assess the ability of the informal caregiver to cope with this eventuality? Adequate, inadequate		
If the death of the patient is imminent, how would you assess the ability of the informal caregiver to cope with this eventuality? Adequate, inadequate		
Is the primary informal caregiver frail, disabled, or in poor health?	PT/OT/MSS/Aide	PS (Age, health status, level of disability of informal caregiver)
How many informal caregivers does the patient have?	Aide	PIDF (Whether there is current or potential in-home or visiting informal caregiver)
Does the primary informal caregiver have other caregiving or employment responsibilities?		
Is the primary informal caregiver willing and able to provide personal care for the patient if needed?		PIDF (Willingness and ability of informal caregiver to take over treatment or personal care) PS (Types of tasks performed by informal caregiver since home health admission)

TABLE C.5 (continued)

Informal Caregiver Characteristics (Ask only if patient has a live-in or regularly visiting informal caregiver)	Discipline/Treatment Cued by Characteristic	Current Data Collection Instrument (Measure)
Is the primary informal caregiver willing and able to assist the patient with transfer if needed?	Aide	
During the last 3 months how many inpatient stays of 3 days or less has the patient had?		
During the last 3 months how many emergency room visits has the patient had?		PS (Number of ER visits in last 6 months)
If the patient has a catheter and requires assistance with its care, has the informal caregiver been able to learn to provide catheter care?	Bladder Instillation	
If the patient has a draining or infected wound and requires assistance with its care, has the informal caregiver been able to learn to provide wound care?	Open Wound Care	
If the patient has a decubitus ulcers and requires assistance with their care, has the informal caregiver been able to learn to provide decubitus care?	Decubitus Care Stage 1-2	
If the patient needs vitamin B12 injections, has the informal caregiver been able to learn to administer the injections?	Vitamin B12	
If the patient is fed by means of a gastrostomy tube, has the informal caregiver been able to learn to administer the feedings?	Gastrostomy Teaching	
If the informal caregiver needs to administer insulin injections, has the informal caregiver been able to learn to administer the injections?	Diabetic Teaching	PS (Whether insulin administered by family member or friend)
Has the caregiver experienced a change in ability to administer the injections?		
If the patient has orders for the infusion of medication, is the informal caregiver available and able to monitor the infusion and the status of the IV line?	Infusion Care	

NOTE: PIDF stands for Patient Intake Data Form; PS stands for Patient Survey. A Patient Intake Data Form is filled out by the home health agency for each demonstration patient at admission to a demonstration home health agency. The Patient Survey was administered to a sample of demonstration patients approximately 3 weeks after admission to a demonstration home health agency.

TABLE C.6

MEASURES ASSOCIATED WITH THE RECEIPT OF PHYSICAL THERAPY AND HOME HEALTH AIDE SERVICES IN ADDITION TO THOSE SUGGESTED BY THE GEORGETOWN DATA

Treatment	Measures Recommended by the Clinical Panel
Any Physical Therapy	*Primary Medical Diagnosis/Procedure* Osteoarthritis/osteoporosis Compression fracture of the spine Hip fracture Joint replacement Parkinson's disease Spinal cord injury
	Secondary Diagnosis Heart disease: COPD, CHF, MI, other cardiac procedures Ataxic or unsteady gait Generalized weakness/paresis Pain
	Other Physical Conditions Increase in the frequency of falling prior to or during HH episode New physician order for equipment or change in equipment Change in ability to ambulate, dress, or perform other ADLs prior to HH episode
	Emotional/Cognitive Conditions Adjustment reaction to physical change/depression associated with stroke or amputation Ability to cope with medical and social problems Noncompliance with plan of care/ general level of cooperativeness Level of comprehension (ability to carry out or retain instructions) Disorientation/confusion Source of cognitive impairment
	Informal Caregiver Characteristics Change in informal caregiver involved with PT program Ability to cope with medical and social problems of patient and affecting home PT program Whether primary infromal caregiver is frail, disabled, or in poor health

TABLE C.6 (continued)

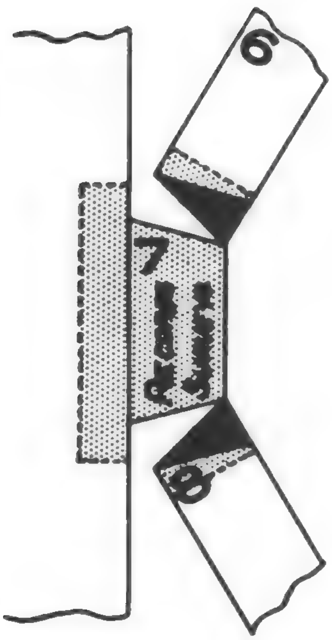
Treatment	Measures Recommended by the Clinical Panel
Any Home Health Aide Treatment	*Secondary Diagnosis* Decubitus ulcers Interiginous, perineal or stasis dermatitis *Other Physical Conditions* Bed- or chairbound Change in ability to perform ADLs or IADLs just prior to HH episode *Emotional/Cognitive Conditions* Willingness of patient to accept personal care from informal caregiver Willingness of patient and caregiver to accept care from a home health aide *Informal Caregiver Characteristics* Number of informal caregivers Whether primary informal caregiver is elderly Whether primary informal caregiver is frail, disabled, or in poor health Whether primary informal caregiver has other responsibilities Whether primary informal caregiver is willing and able to provide personal care Whether primary informal caregiver is willing and able to provide assistance with transfer if needed Number of short hospital stays (3 days or less) (as a proxy for imminent caregiver burnout) Number of ER visits in the last 3 months (as a proxy for caregiver burnout)

HOW TO USE
THESE SEPARATORS

Use one page for each separation.

Select appropriate tab, and further identification if desired, and cover it with scotch tape.

Cut off and discard all tabs except the one covered by tape.



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TABBED SEPARATOR SHEET

Form SSA-695 (1-80)

DEVELOPMENT OF A SURVEY, CASE MIX MEASUREMENT SYSTEM, AND ASSESSMENT INSTRUMENT TO RATIONALIZE THE LONG TERM CARE HOME CARE SYSTEM

Final Report

Volume 1.

June 1986

Rensselaer Polytechnic Institute

Home Care

Classification Project

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FORWARD

This report is the first of two volumes reporting the results of research on home care patients conducted at Rensselaer Polytechnic Institute under contract to the New York State Department of Health. This volume stands alone as a report of the fundings of the research. Volume 2 contains only appendices to the report and generally would be of interest only to those wishing to explore the research method followed in detail.

This report has its own small set of appendices which contain research products recommended for implementation. This report also contains a large number of tables and figures reporting the results of quantitative analysis of the data collected. Because of the large number of tables and figures included, the textual parts of the report are sometimes separated by many pages of tables and/or figures. The indulgence of the reader is requested as they read these sections.

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Appendices

EXECUTIVE SUMMARY

The Resource Utilization Groups - Home Health Care (RUG-HHC) were derived as part of a study on the types of patients receiving home care services in New York State. The research was conducted under contract to the New York State Department of Health by staff in the School of Management and in the Center for Industrial and Management Engineering, Rensselaer Polytechnic Institute, Troy, New York. This summary briefly describes the major activities, products, findings and recommendations from that study. Contents of this summary reflect the opinions, conclusions and judgements of the researchers and not the sponsor.

BACKGROUND

The impetus for this research on the types of patients in home care was the adoption of Chapter 959 of the Laws of 1984. The intent of this law was twofold: increase the availability and accessibility of home health care services; and ensure the quality of care provided by all home health agencies. It is expected that Chapter 959 in conjunction with changes in other segments of the health care delivery system will signal a dramatic expansion of the home care system to meet the demands placed on it.

The main goal of the research was to develop a patient classification system and the related assessment and information systems to allow for the rational and effective expansion of home care services in New York State. To carry out this goal, the project consisted of four major activities:

- Patient Characteristics and Care Needs. A comprehensive survey of health and ADL/IADL needs of patients in a representative New York State cross section of Certified Home Health Agencies, Long Term Home Health Care Programs, Personal Care Programs, and Non-Licensed Home Care Providers was performed. The survey covered the informal support system, unmet health care needs, treatment goal of each patient, factors which led to choice of that provider, and level, kind and amount of services provided.
- Patient Classification System. A case mix approach to classifying patients from the survey information was developed. The groups are such that generally the care needs of patients within a group can be met by one home care provider type. To the extent possible, this system was integrated with the RUG-II system for classifying nursing home patients.
- Redefine Program Boundaries. Based on the classification, current home care program boundaries were described home care and patient placement guidelines which promote efficient and effective delivery of care were recommended.
- Develop Screening and Assessment Instrument. A screening process to route patients into each of the home care programs was developed. A comprehensive assessment instrument which leads to development of a care plan that addresses the patient's problems and incorporates the informal support system into the care plan was also developed.

A summary of the research activities under each of these major activities follows.

PATIENT CHARACTERISTICS AND CARE NEEDS

The research need to describe the home care population required that a detailed survey of patients in home care incorporating characteristics of the patient, informal supports and services received (resource use) be conducted. This data collection was done in 43 home care providers across the state using a 22 page, 66 question research assessment instrument. Providers participating in the data collection included Certified Home Health Agencies (CHHA), Long Term Home Health Care Programs (LTHHCP), Personal Care/Home Attendant Programs (PC), Non-Licensed Home Care Providers, Community Alternative System Agencies (CASA) and Community Services for the Elderly Programs (CSEP).

To ensure uniformity of data, a training program was conducted to teach both data collection procedures and definitions of assessment questions and descriptors. Approximately 300 people attended the training sessions given at 15 sites throughout the state. Aside from training, other characteristics of the data collection directed towards insuring quality were:

- A hotline was established as a resource for use by home care provider staff to answer questions about data collection. This hotline was staffed daily during the two month data collection period of the research.
- Modifications to data collection procedures to reflect field encountered conditions were developed and communicated to all agencies.

- An on-site visit by staff of the research during the data collection period was done. The purpose of this visit was to identify data collection problems in a provider and to correct problems early in the data collection period.

A total of 2425 usable assessments were collected from all participating home care providers. This database provided a core on which to build the classification system.

PATIENT CLASSIFICATION SYSTEM

The database contained a wide diversity of patients in terms of their individual characteristics, program providing services, geographical origin, and principal payor. In terms of Activities of Daily Living (ADL), patients were found to be generally unimpaired except for Dressing, Personal Hygiene and Bathing where a diversity of dependencies was found. For Instrumental Activities of Daily Living (IADL) a wide diversity of dependencies was found both between questions and within questions. Most patients were found to have no problems in their cognitive ability or behavior patterns. Most patients were also found to have no problems with memory loss or to have impaired decision making.

The development of the classification system was an iterative process involving clinical input from a Workgroup convened for this research and the insights which the database provided on the prevalence and resource use consequences of a patient condition. The classification was designed with the following objectives in mind:

- <u>Resource Measurement</u>. The classification system should measure resource consumption more accurately than any other system.

- Resource Type Use Discrimination. The classification system should discriminate between the different type of home care service personnel used to care for the patient.
- Clinical Meaningfulness. The system should be respected by clinicians as one which can be understood within a generally accepted clinical framework.
- Reliability. The classification should be based on patient characteristics which generally can be assessed accurately. Accuracy at the characteristic level leads to reliability of the classification.
- Improved Understanding of Home Delivered Service System. Classification of patients into the system should aid providers, regulators, and researchers in their understanding of the types of patients cared for, their relative cost, mix of service need, and the efficiency of different home care program placement. Informations systems using the classification should be usable for many purposes.

The classification development approach followed was the Hierarchy Model. This model provides a clinical structure to the classification. Groups were identified using judgements as to whether they are clinically or administratively different from one another in terms of resource use. These groups form the core of the classification system and other characteristics are used to differentiate patients further.

In most cases, there will be more than one condition which, when singly present, would result in placing a patient in one of the

hierarchy groups. The conceptual model of the hierarchy relies heavily on recognizing that the conditions are used as indicator variables and homogeneity of a group is not because the conditions are the same but rather that the resource use patterns of patients with these conditions are similar.

RUG-HHC hierarchy groups are:

Rehabilitation. This hierarchy category contains those patients receiving two or more hours of restorative therapy per week from PT, OT and/or ST in combination or singly.

Special Care. Patients in this hierarchy category are characterized by a need for skilled nursing to perform services and to closely monitor patient condition. Patients generally have severe medical problems. Medical conditions which qualify a patient for this hierarchy are grade 4 decubibus, dialysis use, suctioning, comatose, quadriplegia, parenteral fluids, daily intravenous injections, nasagastric feeding and catheter insertion and care.

Mentally/Behaviorally Impaired. This hierarchy category consists of patients who, because of mental or behavioral problems, need assistance and monitoring to prevent actions by the patient which many be a danger to the patient or others. Conditions which qualify a patient for this hierarchy are weekly or more often occurences of forgetful behavior, inappropriate and dangerous decisions, verbal disruption, physical aggression, and disruptive behavior.

Complex Management. The patients in this category, while somewhat similar to Special Care patients, are characterized by lower skilled care needs. Medical conditions qualifying a patient for this hierarchy are dehydration, terminal illness, internal bleeding, hemiplegia, intravenous transfusions, ventilator use, and grade 3 decubitus.

Physical Impaired with Skilled Care Needs. The use and need for skilled nursing care characterizes this patient category in addition to ADL and IADL needs. Patients with need for assistance with medications, nursing monitoring, ostomy care, range of motion exercises, tracheostomy care and wound care qualify for this hierarchy.

Impaired Community Living Skills. This category is characterized by patients principally needing assistance with ADL and IADL activities with none of the other hierarchy conditions.

Differentiation of patients within each hierarchy group is done using the ADL and IADL dependency of the patient. Both are measured using scores, which are computed from a measurement of patient ability in several ADL or IADL dimensions. The ADLSCORE is based on the patients ability in EATING, TRANSFER, TOILETING AND BATHING. This score ranges in value from 4 which indicates independence in all four ADLS to 19 which indicates the highest dependency level in all four ADLs.

The classification's IADLSCORE is based on the patient's ability in SHOPPING, COOKING MEALS, AND LIGHT MEAL PREPARATION. These IADLs represent both inside and outside of house activities. The score ranges from 3 to 9 with 3 representing independence in all three IADLs and 9 indicating high dependence in all IADLs. RUG-HHC is a 27 group classification system with 6 hierarchy categories.

Without any adjustments to the data to reflect informal supports, geographic differences in resource use, and home care program specific patterns of resource use, the classification explains 30.6 percent of the variation in resource use among patients. For home care programs within a given geographic area, the explanatory level is higher. In the Personal Care/Home Attendant program in New York City, the explanation level is 59.5 percent.

For each RUG-HHC group, a case mix index (CMI) was computed. The CMI represents a relative measure of utilization of resources. The reason for developing a CMI is the ease of use of it in many applications. Because it shows the relative intensity of patients in any program or agency, it allows direct comparison of patient mix between different programs or agencies. A CMI is also independent of inflation and wage factors.

REDEFINE PROGRAM BOUNDARIES

The RUG-HHC system was used to analyze the existing placement pattern of patients into home care programs. The patterns of patient concentration that are observed are:

- The LTHHCP is concentrated in Mental, Clinical and Physical hierarchies. The percentage of patients in each of these hierarchies is roughly that seen for the RHCF population in New York.
- The Personal Care/Home Attendant program has patients across all hierarchy groups, with concentrations in Mental, Physical and Impaired hierarchies.
- CHHA patients tend to be found in all groups with the exception of the Impaired. There are large numbers of CHHA patients in the Rehabilitation, Special, and Complex hierarchies but a majority are in the Physical hierarchy.

Overall the programs are fairly well targeted to the types of patients for which the programs were originally intended, however, there are clearly exceptions to this general observation and RUG-HHC can be used to further refine the placement of patients in programs. With refinement using RUG-HHC, there will continue to be an overlap of program responsibility for a given patient type, especially between the CHHA and the LTHHCP. The original program intent of these two provider types based on the length of stay (LOS) of patients should be used as a mechanism for refining the partition.

The availability of a CMI presents an opportunity to review program costs for individual patient categories and across all patients in a program. Such analysis can be used with care needs reflected in the RUG-HHC to establish cost effective as well as care need sensitive patient placement patterns. When case mix is controlled for, the Personal Care/Home Attendant program is approximately 20 percent more expensive than the LTHHCP for direct care dollars. The caps in the LTHHCP compared to the PC program appear to lead to such cost differences.

DEVELOP SCREENING AND ASSESSMENT INSTRUMENTS

The research revealed two needs for information about home care patients. The first need was to screen patients into home care programs which could appropriately and cost efficiently meet the care needs of the patient.

The second need was to maximize the use of the informal support system (ISS) in meeting the care needs of the patient. The determination from this research from working with the database and with the Clinical Workgroups was that the role and use of the ISS can really only be considered within the context of care plan development.

To respond to these two needs, two assessment processes were designed. The first is screening logic to be applied to patients at time of referral to home care. The logic closely parallels the present contents and design of the PRI/SCREEN. The logic focuses on the patients need for skilled care and monitoring and the duration of need.

The second constitutes a care planning assessment which requires the identification of patient problems and needs and the design of services from both the ISS and formal provider system to address the needs and problems of the patient.

The assessment instrument is called the Patient Assessment Tool for Home Care (PATH). The PATH is designed to be part of care planning for the home care patient. The PATH assesses the client's ability to function on various dimensions and measures the degree to which the client needs services/care. Each section of the PATH has implications for completing the plan of care/services that the client requires. The PATH also includes a CARE PLAN SUMMARY, in which all the client requirements are integrated to determine what specific services/care the client needs, who will deliver them and how often they are needed.

The PATH provides a standardized, comprehensive and objective client assessment to determine the extent of functional ability and the need for care and services. It gives specific guidelines to assure the needed services are identified, and, by evaluating the client's level of functioning, motivation and attitude toward his/her situation, it improves the client's acceptance of the Care Plan. The types and hours of service the informal caregivers will provide is specially assessed, as well as those that will be provided by the formal services.

Applying the RUG-HHC classification to the database demonstrates, that many persons in home care have low frequency and low overall resource use needs. The scope of the PATH for this type of client far

exceeds the requirements in order to respond to these needs. An assessment for this type of patient would consist of recording no need exists for most items except for a few ADL/IADL dimensions. In order to target completion of sections of the PATH appropriate to measure these types of needs without the need to complete all sections of the PATH, an Assessment Target question has been incorporated into the PATH. Based on the response to this question, the user is directed to either complete only selected portions of the PATH or to complete the instrument in full.

RECOMMENDATIONS

Recommendation 1. A CMI should be used to set case mix specific caps at program level in the LTHHCP. Whether the RUG-II or the RUG-HHC CMI's should be used is a matter for debate. The traditional concept of tying the cap to the RHCF rate would lead to the use of the RUG-II CMI while the RUG-HHC CMI is more directly related to the cost of caring for the patient at home.

Recommendation 2. At a minimum, separate CMIs and resource targets based on the status of the informal support system (ISS) should be used for the high disability RUG-HHC categories. This is functionally equivalent to bringing the ISS into the classification system by splitting a RUG-HHC category into a 'With Informal Support' and a 'Without Informal Support' group. If administrative feasible, this feature should be extended to all RUG-HHC categories.

Recommendation 3. Reimbursement or service authorization controls should be placed on the PC program to address and decrease the difference in casemix controlled cost between the PC program and other home care programs. The RUG-HHC system provides a framework on which to base these controls.

Recommendation 4. Patients in the Impaired categories should be exclusively assigned to the PC program. Currently the CHHAs and LTHHCPs do not have major numbers of patients in the Impaired groups; thus the change would be incremental.

Recommendation 5. Significant numbers of PC patients fall within the Rehabilitation hierarchy. These patients are most likely receiving services from multiple home care programs and agencies as provided for in the PC regulations. In order to focus care of these patients within a single program, patients in the Rehabilitation hierarchy should be cared for in the CHHA or LTHHC program.

Recommendation 6. Approximately 3% of the PC program patients are in the Special Care receiving relatively low levels of RN time. Patients in the Special Care hierarchy should be limited to CHHA or LTHHCP placement.

Recommendation 7. A number of patients in the PC program fall within the Complex hierarchy. Patients in this hierarchy generally require skilled management of their care. These patients should be limited to CHHA or LTHHCP placement.

Recommendation 8. A partition or boundary between the CHHA program and the LTHHC programs is one of duration of need or condition. The RUG-HHC classification does not contain a duration characteristic in it since duration was not found to be a predictor of resource use differences. A length of stay (LOS) or duration boundary between the CHHA and LTHHC programs is recommended and 90 days is suggested for consideration.

Recommendation 9. A screening process for directing patients to the recommended home care program should be implemented. For hospitalized patients, the screening process should become part of the existing PRI/SCREEN system. For community based patients, the screen should be incorporated into existing intake and referral processes of home care.

Recommendation 10. The Patient Assessment Tool for Home Care (PATH) should be adopted as the standardized assessment and care planning instrument for persons receiving home care services under the Medicaid program.

Recommendation 11. The State should develop a patient level information system on home care using RUG-HHC elements as the base. This information system would span all home care providers. It should have features which promote timeliness of the data and timely management reports.

I. INTRODUCTION

This report describes the process and results of research on the types of patients receiving home care services in New York State. The research was conducted under contract to the New York State Department of Health by staff in the School of Management and in the Center for Industrial and Management Engineering, Rensselaer Polytechnic Institute, Troy, New York.

The products of the research include:

- a classification system for patients receiving home care services;
- a patient assessment instrument for care planning of home care services;
- review of the current statutory and regulatory framework of home care services;
- recommendations for changes in this framework to better deliver services to different types of patients identified by the classification system.

The research products are the result of a year long research effort which involved:

- primary collection of data on patients receiving home care sevices;
- analysis of this data using statistical methods and expert panel review;
- design of a classification system;
- design of a patient assessment tool which embodies a care planing approach stressing indentification of problems and reliance on available informal supports to address the problems.

This report is divided into 10 sections with large supporting appendicies. There are four major divisions among these sections. The beginning sections describe the data collection phase of the project. Included is selection of the sample, data collection instrument design, data collection process, and data quality activities. Following these topics, profiles of patient data and the process of deriving a classification system are described.

The third division of the report is a review of the regulations, statutes, and procedures which describe and affect home care providers in New York State. The final division describes the development of a care planning assessment tool for home care, discusses the use of the classification, and presents recommendations for changes in the existing structure of home care services.

II. RESEARCH GOALS AND ACTIVITIES

If measurement of the comprehensiveness of a health care program is resources consumed, then home care services in New York are comprehensive. The estimated dollar volume of home delivered services is in excess of half a billion. This reflects a state policy which recognizes that public's health will benefit from a well developed program of home health care.

Despite this commitment, State Government felt that things were lacking in the present organization and array of home services and that changes were necessary. The perception is that the home care industry has evolved into a patchwork of unrelated programs that serves a great variety of health and social support needs with a lack of industry standardization. A common understanding in a programmatic sense of appropriate clients for CHHAs (Certified Home Health Agencies), LTHHCPs (Long Term Home Health Care Programs), PCs (Personal Care Services), and LHCSAs (Licensed Home Care Services agencies) is not present. Significant gaps in services exist in various parts of the State and there is duplication of services between programs. These must be rectified to achieve a rational distribution of health and social support services in the home. Presently, CHHAs, PCs, and LTHHCPs serve overlapping populations and often have differing eligibility criteria which may impede access. The State also lacks a uniform method to determine patient needs since little information is available about the care needs and characteristics of clients. Thus, the State sought to develop a classification and assessment system for home care.

The impetus for review of the home care system was the adoption of Chapter 959 of the Laws of 1984. The intent of this law is twofold: (1) increase the availability and accessibility of home health care services; and (2) ensure the quality of care provided by all home health agencies. This law established authority for licensure of a new class of home care providers, Licensed Home Care Services Agencies. Prior to this law, such licensure was not available although many providers were active providing home care services often times through contractual arrangements with state certified agencies or local social service districts.

The project was started July 1, 1985 and completed June 30, 1986. The major goals were to develop a patient classification system and the related assessment and information systems to allow for the rational and effective expansion of home care services in New York State. To the extent possible, the classification system was integrated with the RUG-II system for nursing home care patients. To carry out these goals the project consisted of four major activities.

1. Patient Characteristics and Care Needs. A comprehensive survey of health, activites of daily living (ADL), and instrumental activities of daily living (IADL) in a representative cross section of New York State CHHAs, LTHHCPs, PCs, and LHCSAs was performed. The survey also covered the informal support system, unmet health care needs, goal of each patient, factors which led to choice of that provider, and level, kind and amount of services provided.

2. Patient Classification System. A patient classification system using a case mix approach for defining groups was developed from the survey information. The groups are such that care needs of patients within a group can be met by a similiar type and amount of home care services. To the extent possible, this system is integrated with the RUG-II system for classifying nursing home patients. The derivation of this classification involved consideration of a clinical view of patients in addition to the resources consumed by the patient. A work group of clinicians was extensively involved in the process.

3. Redefinition of Program Boundaries. Current home care program boundaries as defined in statute and regulation were described. The capabilities and goals of each program type were reviewed against the needs of patients described by the classification system. Changes in the existing boundaries which would promote the efficient and effective delivery of care were identified and a series of recommendations incorporating these changes drafted.

4. Screening and Assessment Instrument. A short assessment instrument for classifying patients into groups of the classification system was designed. A comprehensive assessment instrument incorporating a problem orientation to care planning and promoting use of informal supports in the care plan was also designed.

The phases for each of the above activities are summarized below.

II.A. PATIENTS CHARACTERISTICS AND CARE NEEDS.

There were four major phases in this activity.

1. Development of Data Collection Instrument and Procedures. The issues involved in this development process were: what characteristics of the patient should be and can be measured? ; what should be included to measure the living environment and informal support system? ; and how will the data be collected? Sources used in resolving these issues included staff analysis of existing instruments, consultation with home care providers, and review by a statewide advisory group.

2. Development of a Sampling Plan and Recruitment. Considerations in the selection of agencies and patients included size of the sample and on what basis will agencies be chosen for participation in the study? Recruitment involved selection, invitation, and finally, establishment of a close working relationship to retain committment of an agency to the research.

3. Training of Agencies and Personnel for Data Collection. A key component in the collection of high quality data is that all data collectors are consistent in the collection of data. Thus the issues are: how to achieve consistency among many assessors from varying backgrounds and environments, and how can assessors be made to think in terms of the developed assessment instrument being used rather than others in use? Extensive training of home care agency personnel with post-training follow up was done to achieve the desired outcome.

4. Assurance of Quality Data. Data quality was promoted by providing a mechanism for data collectors to resolve questions and problems, on-site monitoring of activities, and review of collected data for completeness and validity. Each of these actions was taken to assure high quality and complete data.

II.B. PATIENT CLASSIFICATION SYSTEM.

This activity was technically complex in the context of the statistical procedures involved and in the context of designing a clinical rationale into the classification system. There were five phases to this activity.

1. Descriptive Analysis of Patients. This exploratory data analysis resulted in identification of general characteristics of patients on a single dimension basis. It was useful for identifying patients who are infrequent with respect to the single dimension and for finding the most common characteristic of patients. The patient who appears infrequently is often one which emerges as an important one in a classification system.

2. Exploration of Other Classifications. Both the contents and structure of other patients classifications were explored. This type of analysis led to identification of patient types which are included in the classification system as well as the adoption of a classification design approach which is reflected in the structure of the classification.

3. Identification of Patient Characteristics for Inclusion in the Classification. Some patient descriptors are not good in a classification because the descriptor itself is unclear. In other cases, incorporating some dimension of a patient in classification is not feasible because it cannot be measured at a classification level. In this analysis, descriptors were reviewed from the perspective of their desirability in a classification system.

4. Clinical Advice. The clinical meaningfulness of a classification is established by working with clinical users and incorporating clinical concepts in it. A clinical work group was established and convened frequently during the development process to review research staff activities and to offer advice and direction.

5. Classification System Synthesis. The classification system was a conclusion to the analysis steps and involved synthesizing statistical results, clinical judgement, and design considerations in a cohesive manner to design a consistent, meaningful and valid classification system.

II.C. REDEFINITION OF PROGRAM BOUNDARIES.

The classification system provided a method for reviewing the needs of patients against the capabilities of home care programs. Using this form of comparison, program boundaries were analyzed to determine a match between patient needs and program capability. This activity required analysis of a program's capacity to provide services, fiscal policies, specific payment system approaches (including the integration of specific guidelines for utilizing the classification system), and the characteristics of home care patients measured in the classification system. There were two phases to this activity.

1. Review of Statutory and Regulatory Definitions. A review and summary of boundaries of a home care program as presently established in the regulatory system was completed. This reviewincluded the capacity of a program with respect to the types of services it could provide, the payment mechanism for a program, admission requirements and method, and the goal or mission of the program.

2. Boundary and Patient Characteristic Comparison. The classification system is reflective of the patient's needs in a home care system. A review of patient types against program capability and goal yields a fit between the two which matches capability with need. The comparison forms the basis for recommendations on program boundary changes in terms of the types of patients tobe cared for by each program types.

II.D. SCREENING AND ASSESSMENT INSTRUMENT.

In order for the results of this research to be implemented at the patient level, screening and assessment instruments were developed. These instruments are part of an information system which should be made functional at the home care agency level as well as at the state level. The phases of this activity involved both instrument design and consideration of its use.

1. Refinement of Classification System Elements. The classification is based on data elements collected on the research instrument. Since they are now a critical component in a patient classification system, the definitions of the elements were refined to increase specificity and reliability.

2. Identification of Care Planning Elements. Care planning is an activity where the elemental needs of a patient are identified and a plan developed to address these needs. In this phase of the activity, the patient elements important to care planning for home care were identified.

3. Instrument Layout. This phase was concerned with the format of the instrument and the integration of care planning with needs determination through the layout of the instrument.

4. Information System Options. The assessment instrument provided a base around which information system options were designed. The options are explored at the provider and state level.

The products of each activity promote a better understanding of the home care patient and system. While the activities are presented individually and in a sequence, they are not really sequential nor independent. The next two sections summarize the research steps of the survey activity.

III. COLLECTING PATIENT CHARACTERISTICS AND CARE NEEDS

This chapter describes research steps and products related to building a data base on which the classification system was designed. This activity began in July 1985 and extended into April 1986. In all stages of this activity, the primary goal was to establish a high quality, exhaustive and accurate data base.

The four major categories of tasks in this activity were:

. Development of a Data Collection Instrument and Procedures
. Development of a Sampling Plan
. Agency Training in Data Collection Procedures
. Data Quality Assurance.

While much of the work associated with these tasks was performed by research staff, there was extensive involvement of many other individuals including the Statewide Home Care Advisory Committee. Three meetings of this Committee were held and the principal agenda item of two of the meetings was data collection. The comments of the Committee on this activity will be presented within the discussion of the four task categories.

The process of data collection has distinct, yet interrelated, activities. The precedence order of these activities as reported here does not reflect the actual chronological order of the decisions and tasks because many simultaneous and interrelated tasks are ongoing. The tasks of the data collection process are described both in terms of the rationale for the design or decision made and the decision itself.

III.A. DEVELOPMENT OF DATA COLLECTION INSTRUMENT AND PROCEDURES

IIIA.1. Data Collection Instrument

The research goal to establish a classification system for patients receiving home care services demanded careful attention to both the content and the format of the research data collection instrument. It was important to avoid errors of omission, leaving off questions about a patient which capture an important dimension, and errors of impreciseness, asking questions which have low reliability.

Specific to the target population of this research, the research instrument had to reflect through its questions and responses the wide diversity of home care patients within the multiple home care programs. This diversity included the patient with intense skilled nursing service needs and the patient needing only assistance with a single activity such as shopping.

The research goal required that in addition to a description of the patient, a detailed description of the services received by the patient was necessary. A full description of the services received included the frequency and length of time of services provided by either the formal or informal support system.

Other considerations reflected in the design of the instrument were:

- The instrument accounts for the various factors influencing the services needed and provided such as: the patients informal supports and their contribution to patient care; the patients living environment; the multiple sources of services to the patient.

- The instrument has a high level of commonality with the Patient Review Instrument (PRI) used in the assessment of nursing home patients to allow comparisons between the populations.

- Characteristics of newly emerging types of home care are included.

- Questions and responses are written in terms that home care providers are familiar with.

- Important instructions are included on the assessment instrument.

- To the extent feasible within overall length considerations, definitions of terms are included directly on the instrument.

- Responses to questions are expressed in quantifiable terms. Responses which reflect a frequency of occurrence define the frequency in quantitative terms such as number of occurrences per week.

- Important words and phrases are highlighted using underline, bold print, or capital letters.

- The instrument is organized along subject sections and a consistent format is followed.

A number of steps were involved in the resource intense effort of developing the instrument. A number of patient assessment instruments (including patient level dimensions of environment and informal support system) were reviewed. Some were instruments used in research projects while others were instruments used in the care planning process for home care patients both as state mandated forms and agency designed forms. Home care instruments in particular were sought. The instruments from the Visiting Nurse Association of Omaha and the Visiting Nurse Association of New Haven, Connecticut were very helpful.

With the experiences of others as a starting point, RPI staff had numerous meetings concerning the focus of sections of the instrument and staff members were assigned primary responsibility for developing sections. These draft sections were circulated among staff and revised to reflect the comments made.

The first public draft of the instrument was prepared on October 8, and circulated to the Advisory Committee. This instrument was also pilot tested by six home care agencies who assessed patients and critiqued the instrument using their pilot test experiences.

The second public draft of the instrument was prepared in early November 1985. A meeting of the Advisory Committee was held with a significant part of the meeting devoted to reviewing the draft instrument. The second draft was also pilot tested by six home care agencies.

While many comments on both drafts were directed at changing the way a question was asked or the responses (descriptors) that were used, there were a large number of comments and suggestions which, when incorporated into the instrument, substantially increased its length. A specific request to all reviewers was to critically consider items on the instrument for deletion. Although reviewers were unable to agree on items to delete and, in fact, discouraged deletion of any item, the length of the instrument was decreased by staff through format tightening and elimination of redundant items.

III.A.2. Patient Assessment Tool for Home Care (PATH)

The final draft of the research PATH,(Volume 2, Appendices) was developed in December 1985 and was used by the participants of the study. The PATH contains eight major sections designed to collect information regarding health needs of home care patients: demographic and administrative, medical condition, activities of daily living (ADL), instrumental activities of daily living (IADL), cognitive and behavioral functioning, environment/home, informal support, and services and treatments.

A total of 66 questions appear on 22 pages of the PATH. It is physically a long instrument. Because of the variety of characteristics among home care clients and because of the variety of services and programs provided, each item which appeared on the PATH was necessary in order to gain an in-depth understanding of home care clients' needs and resource consumption. Furthermore, the PATH is a research tool and as such contains items which may predict resource consumption, but until an extensive statistical analysis guided by clinical insights is conducted, each item remains as an untested indicator of a level in a classification scheme.

III.A.3 Issues/Perspectives of the Advisory Committee

In addition to assessing the ADL and IADL needs of clients, the members of the Advisory Committee specifically emphasized:

- Assess the clients' informal support system.
- Develop some type of measurement of mental functioning.
- Capture the variety of community providers that clients utilize.

Figure III.D
Proprietary Home Care Agencies
Data Collection Procedures
Flowchart

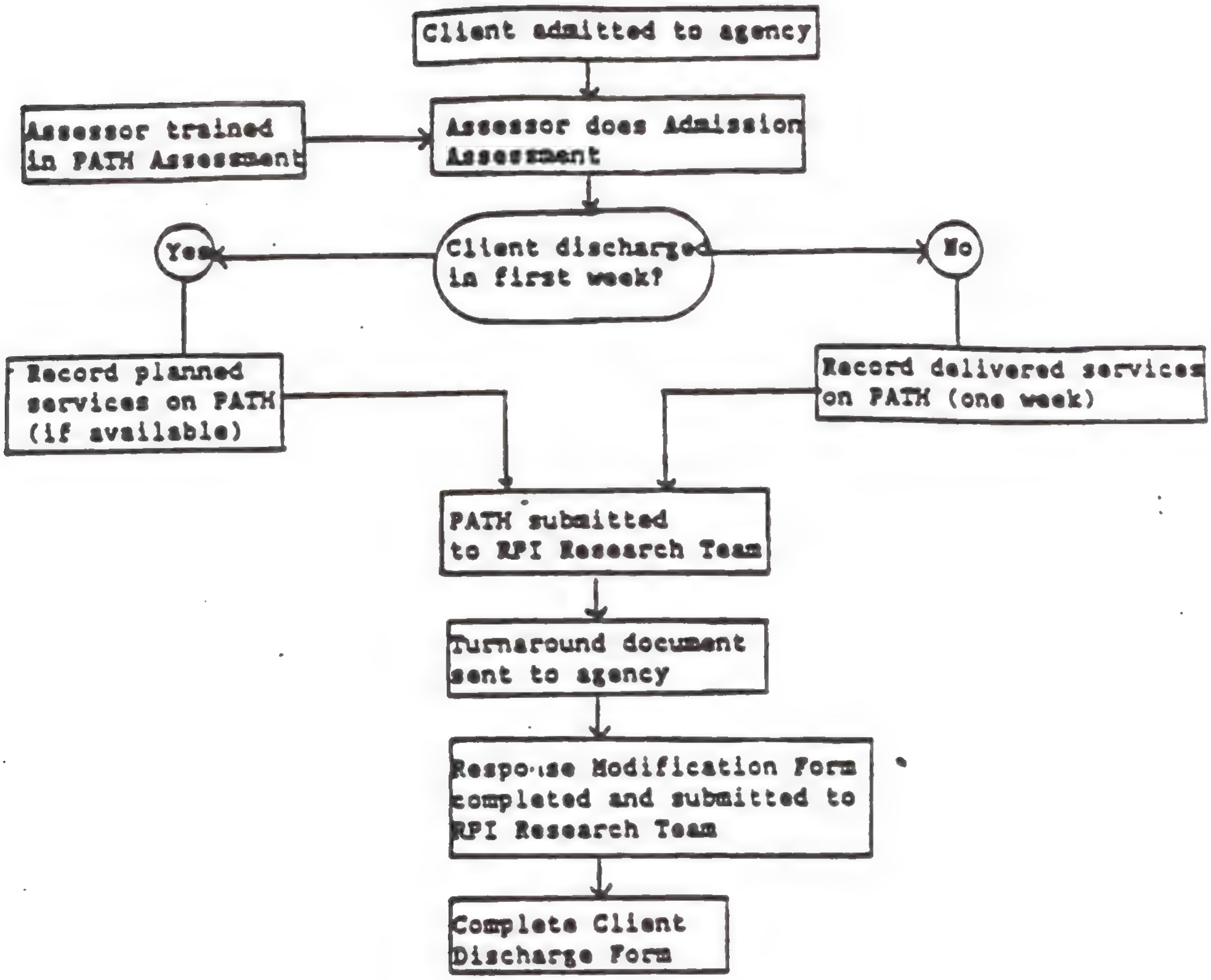


Table III.5
Summary of Data Collection for CASAs

Length of Data Collection	7 weeks
Responsible Party	Nurse: Medical Sections Local DSS Caseworker: Social history, informal support, planned or authorized services
Triggering Event for PATH Completion	Referral, reactivation, and reauthorization; current caseload
Services rendered services	Admitted = budget authorized Not Admitted = planned services
Return PATH	After Services recorded on PATH
Turnaround document Modification Forms to the Project Team	Complete and return Response

Three events require the completion of the PATH by the CASA nurse and local DSS caseworker: referral, reactivation of a client, or the reauthorization of a service/budget plan. For all events, the PATH was completed in full. The PATH was also completed for current clients to achie ve the number of assessments which were requested.

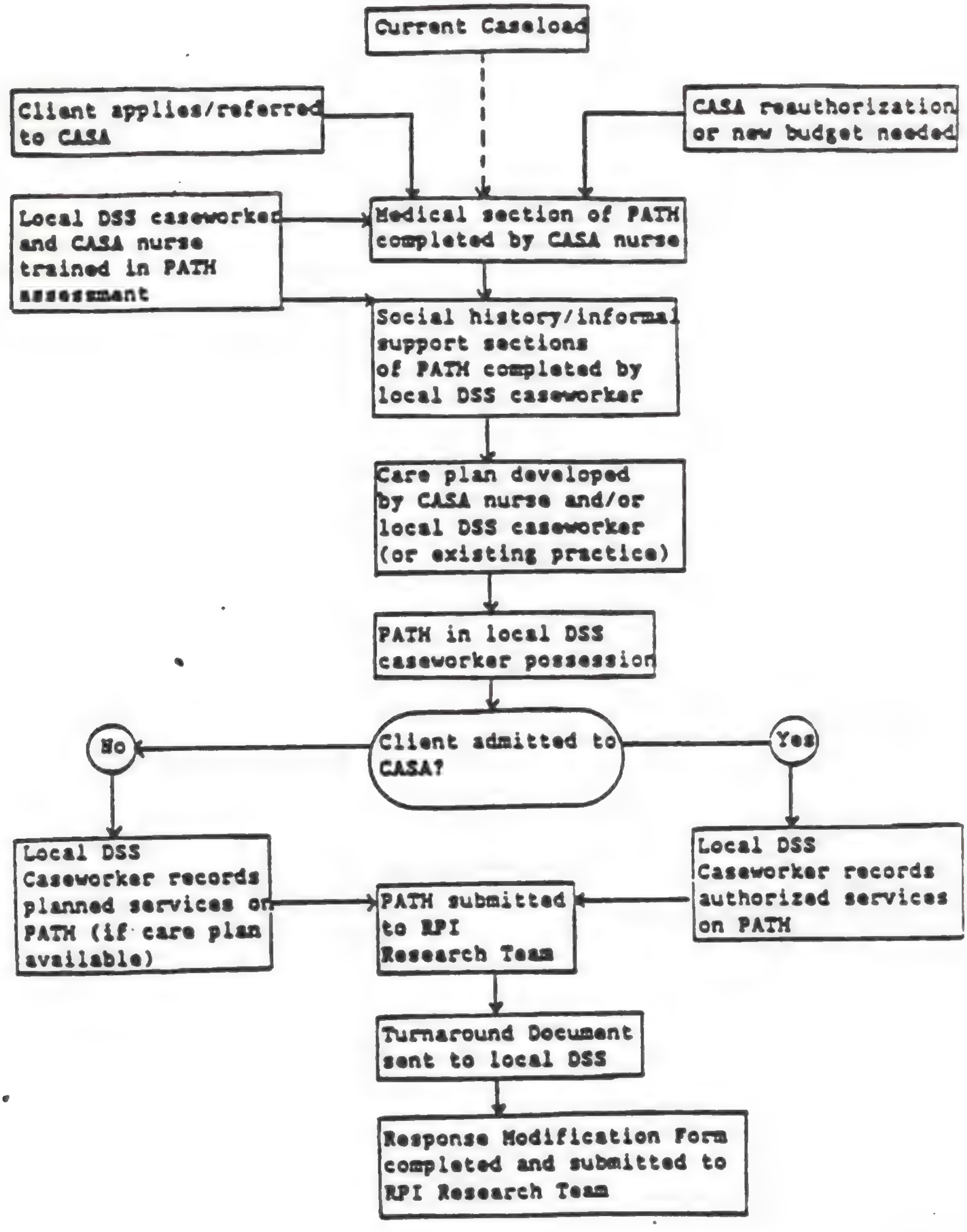
The CASA nurse completed the medical portions of the PATH (Sections I through VI and the treatment portion of Section VIII). The local DSS caseworkers completed the social history, informal support, and services portions of the PATH (Section VII, Section VIII). When local procedures were different from the above, local procedure for completion of assessment were followed.

The authorized services were recorded in the appropriate sections (Section VIII) of the PATH. If the client was not admitted or services were never authorized, the local DSS caseworker recorded the planned services.

III.C. DEVELOPMENT OF A SAMPLING PLAN

The sampling plan is concerned with the selection and recruitment of home care agencies for participation in the data collection and with developing agency level targets for the number of patients to be assessed and the diversity that these patients should represent.

Figure III.E
Community Alternative Service Agency
Data Collection Procedures
Flowchart



III.C.1 Sampling Plan Rationale

Several considerations were identified as important to the development of the sampling plan used in the selection of home care agencies as participants in the project. In order to generate a classification system, the sample had to reflect a broad range of home care patient characteristics (including ADL, IADL, illness, and living situation) and concomitant use of services such as the type of resource used (skilled, homemaker, personal care) and amount of services provided. Another important consideration was to attain discrimination of the services given in response to patient needs, and not in response to administrative or organizational factors. Additional considerations included geographic differences (urban, suburban, and rural) which affect the need and the delivery of services, and influences due to differences among programs, with regard to their missions, philosophies and management styles. In response to these considerations a purposeful sampling plan rather than a proportional sampling plan was designed. A purposeful samping plan is one which has goals other than satisfying statistical considerations.

Based on these sampling concerns, the following guidelines for sample selection were formulated.

- In order to discriminate receipt of services in response to patient needs, only geographic areas with more than one provider type were sought.

- Urban, suburban, and rural sites were selected throughout the state, and in at least one county all providers were sought.

- In addition to selecting Unlicensed Home Care Providers (Proprietary Agencies), Certified Home Health Agencies (CHHA), and Community Alternative Systems Agencies (CASAs), different types of programs were also chosen to assure a diversity of patient-types: Personal Care Programs (PCP, County DSS); and Long Term Home Health Care Programs (LTHHCP).

- A mix of public and private sponsorships, including some hospital-based agencies, were also identified as an important guideline for the sampling plan.

There were also several operational issues which influenced sample selection:

- Since the data collection involved original patient assessment, and not just record abstracts, the census level of the program had to be large enough to justify the investment of agency and project staff in the data collection; i.e., adequate numbers of original assessments occurred in order to result in a large enough sample from the program.

- Programs in New York City may be very different depending on the borough of the patient. Borough level analysis was done so that borough level quotas for sampling could be established.

- Since many certified home health agencies performed assessments for the personal care program, patients under the CHHA auspice of the assessing agency were also included in counties where the PCP was being sampled.

Thus, a hierarchy of sample selection was established. This hierarchy started with selection of a county using the guidelines previously established. Across all counties, statewide quotas with respect to sponsorship were established for different provider-types to further enhance selection of a broad range of patient-types (refer to Table III.6).

TABLE III.6
INITIAL QUOTAS BY PROVIDER-TYPE

	Number of Agencies
Personal Care Programs (County DSS)	8
Long Term Home Health Care Programs (LTHHCP)	7
Certified Home Health Agencies	16
Coordinated Services Providers/Agencies	4
Proprietary Home Care	5
TOTAL	40

III.C.2 Provider Selection and Recruitment

After the establishment of quotas and identification of counties, an inventory of existing providers focusing on caseload, sponsorship, and program auspices was created. These statistics were furnished by the NYS Department of Health (DOH) and the NYS Department of Social Services (DSS). A draft list of providers was developed by the RPI staff using these statistics as a basis for selection and by incorporating volunteering agencies. This list was forwarded to NYS DOH staff and NYS DSS staff for review and comment. A formal response from both departments was received in September 1985 nominating different agencies as well as alternate counties.

At a meeting in October, a final provider list was developed by the RPI project staff in consulation with Nancy Barhydt, NYS Department of Health, Chris Rush, NYS Department of Social Services, and Ann Hallock, NYS Department of Social Services. This list of providers represented a balance of research needs and concerns of the Department of Social Services and the Department of Health. For example, consideration was given to whether all programs offered by a particular agency should be invited to participate in the study (i.e., a CHHA which also operates a LTHHCP). With the establishment of the list, patient quotas for each agency, including a level of oversampling, were given to each agency.

This list was not a list of participants but a list of invitees agreed to by all parties. A letter of invitation was sent to providers by the NYS DOH and the NYS DSS. RPI staff contacted the providers by phone as a follow-up to the letter to explain further the project and to gain a better perspective on the agencies response to the time and resource commitment required by the data collection procedures. One topic of the follow up call was discussion of the quotas established for the agency. Furthermore, although the RPI staff had developed a generic approach of the method of data collecting by agency staffs, an important aspect of these initial phone contacts was discerning the modifications required in the data collection procedures to asure a reliable process.

During the invitation process, a number of the Certified Home Health Agencies stated that they were experiencing major difficulties implementing a new Medicare claim form. They reported that their staffs were overburdened with paperwork and their participation in this project was questionable on the original timetable. As a consequence, data collection originally scheduled to start in December was delayed until January 1986 for all but one agency.

A total of 34 agencies (Table III.7) participated. In several situations, a single agency could collect information about patients on up to three different provider types, e.g., CHHA, LTHHCP and PCP. Of note, at the request of the New York State Office for the Aging, the sample also included five Area Agencies. Refer to Appendices in Volume 2 for a complete list of Agency Addresses and the research contact in the agency.

TABLE III.7
PROVIDER-TYPE PROFILE

<u>CHHA</u>

VNA Albany
Broome DOH
VNA Buffalo
Franklin DOH
Onondaga
VNA Troy
Nyack Hospital
Good Sam. Hosp.
Ulster DOH
United Hospital
Westchester DOH
Montefiore
VNA-Brooklyn
VNS-Manhattan
VNS-Queens
VNS-Bronx
VNA-Staten Island
Nursing Sisters HVS

<u>Unlicensed Providers</u>
Recco
Med. Per. Pool-Buffalo
Med. Per. Pool-Albany

<u>CASA</u>
Broome CASA (LTHHCP)
Broome CASA (PC)
Buffalo CASA (PC)

<u>LTHHCP</u>

Lutheran
24 Rhode Isl. St.
Eddy
Nyack
Montefiore
Metro. Jewish
Beth Abraham
VNA-Staten Isl.
VNS-Queens
VNS-Manhattan
Onondaga

<u>Personal Care</u>
DSS-Dutchess
DSS-Albany
DSS-Franklin
VNS-Queens
VNS-Manhattan
VNA-Brooklyn
VNA-Staten Island

<u>Office of Aging</u>
Dutchess
Rockland
Broome
Chautaugua

III.D AGENCY TRAINING IN DATA COLLECTION

The training activities of the project involved the preparation of materials and in person teaching. The topics of the training activity included use of the PATH and the procedures of data collection.

The principal training material was a 63 page manual which described both the PATH by defining questions and responses and the data collection procedures including instructions for all forms used in the process. The manual made extensive use of examples to explain the assessment instrument and use of sample completed forms to demonstrate correct procedures.

The manual was designed as a working and reference document for the research. An index guided the assessor to the page of a topic of interest. Included in the manual was a description of the research project and the analysis steps planned for the collected data. A theme throughout the manual was the need for accurate and complete data. A copy of the manual is included in the Appendices.

Additional training materials were prepared for the training sessions given to each assessor. These materials included exercises on the completion of PATH questions.

Training sessions were conducted at a total of 15 sites statewide during the first two weeks of January for the bulk of agencies. One agency received training in December at RPI. This session served as a test of the training materials. A total of 300 people attended the training sessions which generally lasted four hours. Staff committment to this training schedule was extensive. A total of 39 person days in January and 2 person days in December were spent conducting training sessions.

Because the data collection required assessment of patient condition using criteria established for the research, assessors for the research were required to be either registered nurses or social workers. This restriction was required in order to obtain the level of reliability which professional training promotes.

The topics presented during the training session included:

- Introduction to the research
- Data collection procedures individually presented for each provider type
- PATH instructions
- Exercises and examples
- Project procedures relating to data transmittal
- Turnaround document and response modification form
- Question and answer period.

At the close of each session, all attendees were requested to review all training materials prior to start of data collection and to call the research project with any unresolved issues. The general feedback from these training sessions was that they were conducted well and that the PATH reflected the high level of effort which went into it.

III.E DATA QUALITY ASSURANCE

An underlying goal of the data collection effort was to collect high quality data. Quality of data implies several things including:

- validity; the data collected is true in its description of the patient.
- accuracy; the data submitted by an agency has been transcribed to electronic form correctly.
- completeness; there are no gaps in data on a patient. All questions required to be answered are answered.

Quality is an attribute designed into any process. Many activities previously discussed and features incorporated into the data collection procedures promote the quality of the data. Included here are:

- Assessor qualifications. The qualifications for being an assessor for this research were professional training as a registered nurse or social worker.
- Training session. Training was a requirement of assessors. The training session used examples as part of the teaching activity.
- PATH Design. The PATH was designed so that key definitions of terms and instructions were printed on the instrument.
- Data Collection Manual. A manual with expanded directions for data collection and using examples to illustrate critical actions given to each assessor served as a reference that was readily available.

- PATH Pilot Test. Pilot Test of the PATH served to identify problems which were addressed prior to large scale use of the instrument.

These actions all contributed to increasing the validity component of quality. Other activities related to validity, accuracy and completeness are described in this part of the report.

III.E.1 Validity Measures.

In addition to the design aspects of assuring quality, three other activities were incorporated into this project addressing the validity component of quality. These activities were establishment of an information and issue hotline for assessors, modification to data collection to accomodate field encountered conditions and on-site visits and discussions with assessors during data collection.

III.E.1a Information and Issue Hotline.

Critical in any data collection is support of the persons collecting the data. In this research, one form of this support was establishing a communication link with the assessors. This link, a telephone call in line for assessors, provided to assessors an avenue through which they could ask questions on issues related to the data collection (including further explanation of PATH items) and receive answers to these questions. Without this link, assessors would be forced to reconcile the problem on their own.

The hotline number was available to the assessors and coordinators of each agency. The hotline was discussed in the Data Collection Manual and noted on each PATH instrument. Project staff were always available by phone to clarify any unanticipated issues that arose during data collection. At least one member of the Project Staff manned the Hotline each workday from 9am to 5pm during the entire data collection period.

III.E.1b Data Collection Modifications.

Despite review of data collection procedures and the PATH by staff, statewide advisory committee, and others and a pilot test of both procedures and the PATH, field circumstances where the procedures or the PATH proved inadequate or inappropriate arose at training sessions and in the early phase of PATH use. When these were encountered, many times over the hotline, the issue was first resolved for the originating agency and a record kept of the resolution.

Issues of this type and resolutions to them were periodically reviewed t o see if the identified problem was applicable to a wider range of providers aside from the originating agency or to a wider range of PATH questions or procedures. If the decision was yes, an update notice was sent to each participating agency informing them of the procedure change or clarification of PATH question or response. The changes made are presented for both the procedures to be followed and the PATH questions.

Collection Procedures. Several data collection procedures were modified in response to issues raised at training or in calls to the hotline.

Second Assessments in CHHAs. The 3 week time period for the second assessment of a CHHA patient and for recording services was suggested as a guideline rather than a requirement. While a second assessment was required, it was not required in the third week. If the assessing nurse would not normally visit the patient in the third week, a special visit should not be scheduled. Rather, the assessment would be done on the first visit after the third week and the services which were to be recorded were those in the week preceding the actual assessment date.

CHHA Patients Discharged Between Admission and Second Assessment. If a patient was discharged from care of the assessing agency before a second assessment could be done, there was no need to find the patient to complete a second assessment. The only requirement was to complete a discharge form on the patient. If the same patient returned to home care (perhaps from a hospital) during the study period when new admissions were to be assessed, the patient was treated as a reactivation for PATH purposes and followed in the same way as a new patient, including a second assessment.

Specific Questions. Clarification for completing specific questions are presented by order of Question number. These clarifications were used to supplement or replace the Training Manual and PATH instructions.

QUESTION 4. PURPOSE OF ASSESSMENT.
If the patient is new to your program even though they may have been in another home care program of the agency, identify the purpose as 1 = Initial Assessment. For example, a patient is switched from the LTHHCP of an agency to receiving services as CHHA patient.

QUESTION 26. EATING.
If a patient can tube feed themselves without assistance, record that the patient is 1 = Independent in Eating. If an aide or the informal supports are feeding the patient using a tube, then enter the response 7 = Tube or Parenteral Feeding.

QUESTION 60. SPECIALIZED SERVICES.
A major change in what is to be recorded for a patient was made in this question. Previously, only those services under program boundaries were requested. The modification was to record the number of visits and time per week for each therapy, whether or not they are within program boundaries. The question now reflects services from any and all sources.

Not all patients receive services weekly. For some it is biweekly or monthly. To record this frequency of visits and time, apply the following rules:

a) If the number of visits is from 1 to 9 each month but not on a weekly basis, record the number of monthly visits by putting the letter 'M' in the first box under the visits column and the number of monthly visits in the second box. For example, 3 visits per month would be recorded as: |_M|3|

b) If more than 9 visits per month are provided to the patient but not weekly, enter the average number per week and do not use 'M'. This rule is named the 'Monthly Rule' and applies to all services in this question and to Question 61, 63 and 64.

QUESTION 61. TREATMENTS.

The 'Monthly Rule' applies to this question. (See above, Question 60).

Only agency personnel or personnel under contract to the agency should be included in the frequency for the second column, 'PATH In-Home Program'. Other providers, whether delivering services in the home or outside of the home should be counted under the third column, "Out-of-Home Provider". For example, the services given by a private duty nurse who contracts with the patient should be included in the 'Out-of-Home Provider' column.

QUESTION 62. SERVICES

The Monthly Rule' applies to this question. (See above, Question 60).

'PATH In-Home Program Services' include any services under contract that are supervised and/or paid by the PATH agency and which fall within program boundaries.

QUESTION 63. TYPE OF CARE AUTHORIZED

The 'Monthly Rule' applies to this question (See above, Question 60).

QUESTION 64. OTHER PROGRAMS

If the client is receiving service 24 hours per day, 7 days per week, place a '99' in the 'Hours/Week' column and '7' in the 'Visits/Week' column. The space provided on the PATH does not allow a number greater than 99.

III.E.1c On Site Review.

The detection of quality problems does little to enhance quality if corrective action is not taken. Early detection is essential if problems are to be resolved and not promulgated. Frequently, the most questions arise once the assessors actually begin using the instrument. In order to provide an on-site resource to assessors at this critical time, a representative of the research project visited each agency. This representative, named a Project Nurse, was a registered nurse with home care experience trained by project staff on data collection procedures, the PATH, and their responsibilities in the research design.

The visit of the Project Nurse, an independent nurse representing the research, was designed to assure the reliability and validity of

data collected by agency representatives. This visit provided an opportunity for the agency staff to clarify their understanding of the study procedures and assessment instrument before extensive data collection began.

The Project Nurses played an important role in the Home Care Classification Study. Their principle responsibility during the site visits was to ensure that the information submitted and recorded on the PATH was done clearly and accurately. This monitoring role was critical in assuring that quality and reliable data was collected.

The major responsibilities of the Project Nurse during site visits included:

- Accessing patient/client medical records;
- Questioning agency staff participating in the project concerning the patient/client condition;
- Maintaining confidentiality of all patient/client information;
- Using professional knowledge and best judgement in carrying out the review process;
- Documenting their findings appropriately; and
- Maintaining professional behavior and ethics.

Activities during the visit to each agency included the following:

- Reviewing for accuracy and completeness at least 10% of each Assessor's completed PATHs.
- Completing the on-site Project Nurse Assessors Check List. This required verification of the Patient/Client Master List against the PATH and the medical record or medical summary of the Patient. Any problems on the PATH forms that need to be brought to the attention of the Project Team were listed on this form. All errors and inconsistencies in the PATH were also noted. A copy of this form is presented as Figure III.F.
- Resolving any data collection issues concerning the PATH with individual assessors during individual conferences. Conducting a group interview with assessors to capture the formal and informal comments on the strenghts and weaknesses of the PATH and the study itself from the agency staff. The nurse was also responsible for clarifying any misinterpretations and systematic errors found.
- Documenting their overall impression of the agency's competence and compliance in completing the PATHs. A copy of the form used is presented as Figure III.G.

Figure III.F

On-Site Project Nurse Assessors Check List

Directions: Please fill out one form for each Primary Assessor who has completed Patient Assessments. Review 10% of each assessor's PATHs and record your observations below. Use the back of the form if needed. If time permits do more than 10%.

Agency Name ____________________ Location ____________________

Project Nurse ____________________ Date ____________________

Assessors ID No. or Name ____________________

Patient/Client Assessment Tool for Home Health

PATHs Correctly Completed? Yes ___ No ___ Resolution ____________________

PATHs Legible? Yes ___ No ___ Resolution ____________________

Any problems with respones on the PATH that you feel the Project Team should be on alert for? Yes ___ No ___ . Which questions - list by Section and number.

Errors Inconsistencies in Patient/Client Assessments noted:

Patient/Client No.	Problem Noted	Resolution

Figure III.G

Project Nurse Overall Impression of the Agency

Agency Name ______________________ Location ______________________

Project Nurse ______________________ Date ______________________

Do you feel the Project Team should be notified concerning the agencies performance?
Yes ___ No ___ Explain? ______________________

Do you feel the agency requires a follow-up visit? Yes ___ No ___
Why? ______________________

Please summarize your overall impression of the Agency's competence and compliance in the accuracy of completing and recording patient assessments on the PATH. Use the back of the form and additional paper if necessary.

. Transmitting the completed case report forms promptly to the Project Manager, RPI School of Management.

Prior to an agency visit the Project Nurse was responsible for:

. Calling the Agency Coordinator to arrange a convenient visit date.

. Verifying that data had actually been collected by all assessors to warrant a site visit.

Once the Project Nurse arrived at the agency she met with the agency coordinator to discuss the scheduling of personnel. The Project Nurse then obtained from the agency coordinator, the Patient Master List, the Assessors Identification List, and the completed PATHs.

A few patients were randomly selected from the Master List and their medical records or medical summary were reviewed against the completed PATH for the patient. The Project Nurse documented findings of this verification and also briefly described the system of patient identification used by the agency.

The Project Nurse's next activity was to check on patients randomly selected from each assessor for consistency of the number of hours of authorized care with the patient's condition. The findings and outcomes were recorded on the Project Nurses Check List. Following this review the nurse met with individual assessors to discuss their findings and document the resolutions.

In addition to reviewing completed PATHs, the Project Nurse was also available to explain completion of the Turnaround Documents and Response Modification Forms. This was crucial for data auditing by the agencies. It provided assessors an opportunity to verify their responses after intitial data entry.

At the end of the process, an exit meeting was held with the agency coordinator to discuss any major problems. Available to both the Project Nurse and to the agency during the course of the visit was Project Staff via the hotline. Calls were placed if issue resolution proved difficult. At the close of the day, the Project Nurse assembled materials completed during the visit and mailed them to the Project Office. Included in all mailings were:

. On-Site Project Nurse Assessors Check List.
. Group exit interview.
. Project Nurse overall impression of the agency.
. Project Nurses notes.

This on-site presence proved beneficial to all involved. The assessors welcomed having a real person there to ask questions and to assist them in understanding the correct way to complete a form. They also used the opportunity available at the Group Exit Interview to critique PATH questions and to express ideas and attributes that they felt should be featured on an assessment tool to be used for care planning.

From the research perspective, the on-site review gathered information about data collection in the agency and by individual assessors within the agency which was used to establish confidence in the data used in the research. Further, since all assessors knew that their work would be reviewed on-site, it is likely that assessors paid closer attention to detail than would have been present if no such review was scheduled.

III.E.2 Accuracy Measures.

Accuracy is concerned with insuring that the data submitted on the PATH has been correctly transcribed through key entry to an electronic image. There are numerous reasons why an error could arise including character misread by the data entry operator and entering data in the wrong field on the record. The name generally given to errors of this type is keypunch error.

There were four distinct steps in this research which were performed to minimize this type of error and to detect it when it occurred. These steps were:

Form design. The PATH was designed so that data recorded by assessors was put in specific answer spaces and that these spaces were placed on a PATH page in columnar fashion.

Selection of Keypunch firm. A firm experienced in key entry as well as experienced in using source documents such as the PATH was selected.

Keypunch verification. To reduce the need for identification and correction of keypunch errors, the first four-fifths of all submitted PATHs were 100% keypunch verified. Keypunch verification is achieved by having each PATH keypunched twice by different keypunchers and comparing the keypunch image of both. Where the image differs, the source document is used to resolve the difference. This verification was eliminated for the last 500 PATHs because keypunch accuracy was high due to experience with the form.

Turnaround Document. The Turnaround Document contained all questions on the PATH for each patient and reported the keypunch response to each question. Visual comparison of the original PATH to the Turnaround Document was requested of each assessor to check for keypunch error. The Turnaround Document has a larger role in the checks for completeness.

Completeness Measures. Completeness is an important feature of any data base. A data base with missing elements means that data, which is otherwise valid, is not usable if a critical element for the analysis is missing.

Steps to assure completeness used in this research were:

. The training session and data collection manual stressed the need to answer questions on the PATH with the responses valid for that question. For some questions, a code of 'not applicable' was defined and required in order to indicate that the assessor had seen the question and had answered it.

. A computer program was written to check the response for each PATH question against the allowed responses for that question. This program produced two documents which were used to trace and correct errors including errors of omission. These documents were the Turnaround Document and the Response Modification Form.

The Turnaround document (Figure III.H) is a computer printout of the data which was keypunched. The computer program producing this document checked each response and questionable items were flagged. A flag of *** by a question indicated that the response was outside the expected range or a response was required for the question but was missing. Responses flagged with the *** were also listed by the computer on the Response Modification Form for correction. A flag of ??? by a question identifies a response which is not consistent with information from another question and might conflict with response to an earlier question.

All data reported on the Turnaround, whether flagged or not, was to be reviewed for accuracy by the assessor. The original PATHs were returned with the Turnarounds so a comparison could be made.

The Response Modification Form (Figure III.I) was used to change the data that was provided on the PATH or errors which occurred. It was designed to facilitate the assessor's corrections and their entry to the computer. All assessors received the forms pertaining to their clients.

The responses which were flagged as out of range on the Turnaround Document were listed first. Identifying information was indicated consisting of the Client Identifier, Date of Assessment and Assessor I.D.. Item # is the unique identifier assigned to each response on the Turnaround Document. Additional lines were provided to change inconsistent responses and any problems noted during the primary assessor's review of the Turnaround Document.

Instructions contained in the Data Collection Manual and sent out with each package of Turnaround Documents and Response Modification Forms were as follows:

. Make all entries on the form in red.

. To change a response to a blank, enter a B.

. To retain the PATH response for an item listed by the computer, reenter the original response.

. An entry must be made for all computer generated items.

RENSSELAER POLYTECHNIC INSTITUTE
PATIENT/CLIENT ASSESSMENT TOOL FOR HOME CARE
TURNAROUND DOCUMENT

QUESTION	RESPONSE	ITEM#
I. DEMOGRAPHIC DATA		1
1) Client Identifier	1374727	2
2) Primary Assessor ID	1101	3
3) Assessment Date	1-29-86	4
4) Assessment Purpose	1) Initial Assessment	5
5) Type of Home Care Program	2) CHHA	6
6) Service Delivery County	1: Albany	7
7) Responsible County	1: Albany	8
8) Primary Payor	3) Medicare	9
Secondary Payor I	1) Medicaid	10
Secondary Payor II		11
9) Date of Birth	5- 5-1906	12
10) Sex of Client	2) Female	13
11) A.Location of Home Care	2) Special Housing	14
B.Prior Location	2) Special Housing	15
C.Assessment Site	2) Special Housing	16
12) Household, Spouse		17
Household, Children		18
Household, Relatives		19
Household, Signif. Other		20
Household, Other		
II. ASSESSMENT OF CLIENT CONDITION		21
13) Primary Referral Reason	2) Illness/Trauma (Surgery)	22
14) Home Care Goal	1) Return to Pre-episodic Level	23
15) 1.Primary ICD-9 Number	366.9	24
1.Duration, Primary	4) 1 to 5 years	25
2.Secondary ICD-9 Number		26
2.Duration, Secondary		27
3.Secondary ICD-9 Number		28
3.Duration, Secondary		29
4.Secondary ICD-9 Number		30
4.Duration, Secondary		31
16) Angina	1) No	32
Bleeding	1) No	33
Comatose	1) No	34
Dehydration	1) No	35
Dyspnea	1) No	36
Edema	1) No	37
Falls	1) No	38
Hyper/Hypoglycemic	1) No	39
Ostomy	1) No	40
Pain	1) No	41
Stasis Ulcer	1) No	42
Syncope	1) No	43
Terminal Illness	1) No	44
Tracheostomy	1) No	45
Ventilator	1) No	46
Wound Infection	1) No	47
17) Amputation	1) None	

65

Figure II. H

TURNAROUND DATE: 03-20-1986
AGENCY: Visiting Nurse Association of Albany, Inc.
CLIENT IDENTIFIER: 1374727

ASSESSOR ID #: 01
ASSESSOR: Lansburg
PROJECT ID: 110207

RCODE	QUESTION	RESPONSE	ITEM#
			48
	17) Brace/Splint/Limb	1) None	49
	Contractures	1) None	50
	Fracture	1) None	51
	Joint Replacement	1) None	52
	Lymphedema	1) None	53
	Paralysis	1) None	54
	Paresis	1) None	55
			56
	18) Decubitus		57
	19) Decubitus Grade Level		58
	20) Non-English Speaking	1) Speaks & is understood	59
	21) Expressive Communication	1) Generally understands	60
	22) Receptive Communication	1) Hears adequately	61
	23) Hearing - Voices	1) Hears mechanical sounds	62
	24) Hearing - Sounds	3) Moderate loss	
	25) Vision		
	III. ACTIVITIES OF DAILY LIVING		63
	26) Eating	1) Independent	64
	27) Mobility	2) Walks with Device	65
	28) Transfer	2) Equipment Required	66
	29) Dressing	1) Independent	67
	30) Personal Hygiene	1) Independent	68
	31) Bathing	1) Independent	69
	32) Toileting	1) Independent	70
	33) Bladder Control - Days	2) Occasionally Incontinent	71
	Bladder Control - Nights	2) Occasionally Incontinent	72
	34) Ostomy/Catheter		73
	35) Bowel Control	1) Continent	
	IV. INSTRUMENTAL ACTIVITIES OF DAILY LIVING		74
	36) A.Telephone - Answer	2) Independent	75
	A.Telephone - Call	2) Independent	76
	B.Transportation - Public	2) Independent	77
	B.Transportation - Private	2) Independent	78
	C.Prepares Light Meals	2) Independent	79
	C.Prepares Dinners	2) Independent	80
	D.Housework - Light	2) Independent	81
	D.Housework - Heavy	5) Continuous Assistance	82
	D.Housework - Laundry	2) Independent	83
	E.Money Management	2) Independent	84
	F.Shopping	5) Continuous Assistance	85
	G.Appointments	6) Totally Dependent	86
	H.Heating	1) Not Applicable	
	V. COGNITIVE AND BEHAVIORAL FUNCTIONING		87
	37) A.Orientation - Inside	1) Good Mental Clarity	88
	B Orientation - Outside	1) Good Mental Clarity	89
	38) Wandering	1) Does not Wander Unsafely	90
	39) Medication Management	6) Total Assistance	

QUESTION	RESPONSE	ITEM#
40) Nursing Regimen	6) Total Assistance	91
41) Memory Deficit	4) Forgetful Daily	92
42) Impaired Decision Making	3) Frequent Episodes	93
43) Alcohol, Drug Abuse	1) No Episodes	94
44) Verbal Disruption, Freq.	1) No Known Episodes	95
Verbal Disruption, Level	1) No Assessment or Treatment	96
45) Aggression, Frequency	1) No Known Episodes	97
Aggression, Level	1) No Assessment or Treatment	98
46) Inappropriate, Frequency	1) No Known Episodes	99
Inappropriate, Level	1) No Assessment or Treatment	100
47) Depression, Frequency	1) No Known Episodes	101
Depression, Level	1) No Assessment or Treatment	102
Phobias, Frequency	1) No Known Episodes	103
Phobias, Level	1) No Assessment or Treatment	104
Paranoia, Frequency	6) Daily Unpredictable	105
Paranoia, Level	1) No Assessment or Treatment	106
Hallucinations, Frequency	1) No Known Episodes	107
Hallucinations, Level	1) No Assessment or Treatment	108
Withdrawn, Frequency	1) No Known Episodes	109
Withdrawn, Level	1) No Assessment or Treatment	110
VI. ENVIRONMENT/HOME ASSESSMENT		
48) A.Neighborhood Hazards	1) No	111
B.Injury Concerns	1) No	112
49) A.Extra Support, Location	1) No	113
B.Alternative, Deficiency	1) No	114
C.Alternative, Barriers	1) No	115
D.Barriers to Functioning	1) No	116
E.Extra Support, Barriers	1) No	117
F.Barriers, Outside	1) No	118
G.Extra, Barriers Outside	1) No	119
H.Accessible to Workers	2) Yes	120
50) Cooking	1) Within Living Unit	121
Refrigeration	1) Within Living Unit	122
Washer/Dryer	2) On Premises	123
Toilet Facilities	1) Within Living Unit	124
Telephone	1) Within Living Unit	125
Tub/Shower	1) Within Living Unit	126
Running Water	1) Within Living Unit	127
Electricity	1) Within Living Unit	128
VII. INFORMAL SUPPORTS		
51) Informal Supports Exists	1) [illegible] Informal Support Exists	129
52) Primary Caregiver Exists		130
53) Day - Monday	0	131
Tuesday	0	132
Wednesday	0	133
Thursday	0	134
Friday	0	135
Saturday	0	136
Sunday	0	137
53) Evening Monday	0	138
[illegible]sday	0	139
[illegible]esday	0	140
[illegible]sday	0	141

RCODE	QUESTION	RESPONSE	ITEM#
	Friday	0	142
	Saturday	0	143
	Sunday	0	144
	53) Night - Monday	0	145
	Tuesday	0	146
	Wednesday	0	147
	Thursday	0	148
	Friday	0	149
	Saturday	0	150
	Sunday	0	151
	54) Reasons to Supplement: I		152
	Reasons to Supplement: II		153
	Reasons to Supplement: III		154
	VIII. SERVICES AND TREATMENTS		
	55) Diet	1) Regular	155
	56) Prescriptions	4	156
	57) Psychotropic Medication	1) No	157
	58) Oral - Daily	2	158
	Oral - Weekly	0	159
	58) Injection - Daily	0	160
	Injection - Weekly	0	161
	Injection - Monthly	0	162
	58) Intravenous - Daily	0	163
	Intravenous - Weekly	0	164
	Intravenous - Monthly	C	165
	58) Eye/Ear/Nose - Daily	9	166
	Eye/Ear/Nose - Weekly	0	167
	58) Topical - Daily	0	168
	Topical - Weekly	0	169
	58) Suppository - Daily	0	170
	Suppository - Weekly	0	171
	59) 1.Education	2) Service is Provided	172
	2.Training - Nursing	2) Service is Provided	173
	3.Training - Equipment	1) No Service Provided	174
	4.Training - ADL	1) No Service Provided	175
	5.Training - IADL	1) No Service Provided	176
	60) Physical Therapy, Level	1) Service Not Provided	177
	Physical Therapy, Visits	0	178
	Physical Therapy, Hours	0	179
	60) Occ. Therapy, Level	1) Service Not Provided	180
	Occ. Therapy, Visits	0	181
	Occ. Therapy, Hours	0	182
	60) Speech Therapy, Level	1) Service Not Provided	183
	Speech Therapy, Visits	0	184
	Speech Therapy, Hours	0	185
	60) Psychotherapy, Level	1) Service Not Provided	186
	Psychotherapy, Visits	0	187
	Psychotherapy, Hours	0	188
	60) Mental Health, Level	1) Service Not Provided	189
	Mental Health, Visits	0	190
	Mental Health, Hours	0	191
	60) Social Services, Level	1) Service Not Provided	192
	Social Services, Visits	0	193
	Social Services, Hours	0	194
	60) Inhalation Therapy, Level	1) Service Not Provided	195

QUESTION	RESPONSE	ITEM#
	Not by Other In-Home Provider	300
62) House Chores, Hours	0	301
62) 8.Meal Preparation	Not by Informal Support	302
	Not by PATH In-Home Program	303
	Not by Other In-Home Provider	304
62) 9.Housekeeping - light	Not by Informal Support	305
	Not by PATH In-Home Program	306
	Not by Other In-Home Provider	307
62) 10.Housekeeping - Heavy	Not by Informal Support	308
	Not by PATH In-Home Program	309
	Not by Other In-Home Provider	310
62) 11.Financial Management	Not by Informal Support	311
	Not by PATH In-Home Program	312
	Not by Other In-Home Provider	313
62) 12.Laundry	Not by Informal Support	314
	Not by PATH In-Home Program	315
	Not by Other In-Home Provider	316
62) 13.Make/Change Beds	Not by Informal Support	317
	Not by PATH In-Home Program	318
	Not by Other In-Home Provider	319
62) 14.Heating Maintenance	Not by Informal Support	320
	Not by PATH In-Home Program	321
	Not by Other In-Home Provider	322
62) 15.Water - Drawing	Not by Informal Support	323
	Not by PATH In-Home Program	324
	Not by Other In-Home Provider	325
62) Transportation, Hours	0	326
62) 16.Shopping	Not by Informal Support	327
	Not by PATH In-Home Program	328
	Not by Other In-Home Provider	329
62) 17.Appointments	1) by Informal Support	330
	Not by PATH In-Home Program	331
	Not by Other In-Home Provider	332
62) 18.Arrangements	1) by Informal Support	333
	Not by PATH In-Home Program	334
	Not by Other In-Home Provider	335
62) Preventive Services, Hours	0	336
62) 19.Monitoring	Not by Informal Support	337
	Not by PATH In-Home Program	338
	Not by Other In-Home Provider	339
62) 20.Emergency Coverage	Not by Informal Support	340
	Not by PATH In-Home Program	341
	Not by Other In-Home Provider	342
62) Other Service Hours	0	343
62) 21.Dual Recipient	Not by Informal Support	344
	Not by PATH In-Home Program	345
	Not by Other In-Home Provider	346
63) Community/RN: Hours	6	347
Community/RN: Visits	11	348
63) LPN: Hours	0	349
LPN: Visits	0	350
63) Home Health Aide: Hours	0	351
Home Health Aide: Visits	0	352
63) Homemaker: Hours	0	353
Homemaker: Visits	0	354
63) Personal Care Aide: Hours	0	355
Personal Care Aide: Visits	0	356

RCODE	QUESTION	RESPONSE	ITEM#
	63) Environmental Aide: Hours	0	357
	Environmental Aide: Visits	0	358
	63) Program Provider: Hours	0	359
	Program Provider: Visits	0	360
	64) Community Dining: Hours	0	361
	Community Dining: Visits	0	362
	64) Mental Health: Hours	0	363
	Mental Health: Visits	0	364
	64) Nutrition Counsel: Hours	0	365
	Nutrition Counsel: Visits	0	366
	64) Day Care, Medical: Hours	0	367
	Day Care, Medical: Visits	0	368
	64) Day Care, Social: Hours	0	369
	Day Care, Social: Visits	0	370
	64) Volunteer Program: Hours	0	371
	Volunteer Program: Visits	0	372
	64) Delivered Meals: Hours	0	373
	Delivered Meals: Visits	0	374
	64) Legal Services: Hours	0	375
	Legal Services: Visits	0	376
	64) Protective Service: Hours	0	377
	Protective Service: Visits	0	378
	64) Recreation: Hours	0	379
	Recreation: Visits	0	380
	64) Senior Center: Hours	0	381
	Senior Center: Visits	0	382
	64) Contact System: Hours	0	383
	Contact System: Visits	0	384
	65) Comments	1) No	385
	66) Program Appropriateness	1) Appropriate Program	386
	IX. STATUS OF HOME CARE SERVICE		
***	67) Date Service Initiated		387
***	68) Service Status	1) Service Provided 2) Client Died 3) Client/Family Refused 4) Client Admitted To RHCF 5) Client Hospitalized 6) Service Not Authorized 7) Need Met By Othre Program 8) Payment Not Available 9) Home Care Staff Unavailable 10) Need Met By Informal Supports 11) Other	388

*** RESPONSE BEYOND EXPECTED RANGE
??? RESPONSE INCONSISTENT

RENSSELAER POLYTECHNIC INSTITUTE
PATIENT/CLIENT ASSESSMENT TOOL FOR HOME CARE
TURNAROUND DOCUMENT

QUESTION	RESPONSE		ITEM#
Inhalation Therapy, Visits	0		196
Inhalation Therapy, Hours	0		197
) Rehab. Therapy, Level	1)	Service Not Provided	198
Rehab. Therapy, Visits	0		199
Rehab. Therapy, Hours	0		200
) Nutrition Therapy, Level	1)	Service Not Provided	201
Nutrition Therapy, Visits	0		202
Nutrition Therapy, Hours	0		203
) Medication Administration	0	by Informal Support	204
	19	by PATH Home Program	205
	0	by Other Provider	206
1) Brace/Limb Assistance	0	by Informal Support	207
	0	by PATH Home Program	208
	0	by Other Provider	209
1) Bowel/Bladder Program	0	by Informal Support	210
	0	by PATH Home Program	211
	0	by Other Provider	212
1) Catheter, Insertion	0	by Informal Support	213
	0	by PATH Home Program	214
	0	by Other Provider	215
1) Catheter - Care	0	by Informal Support	216
	0	by PATH Home Program	217
	0	by Other Provider	218
1) Chemotherapy	0	by Informal Support	219
	0	by PATH Home Program	220
	0	by Other Provider	221
1) Dialysis	0	by Informal Support	222
	0	by PATH Home Program	223
	0	by Other Provider	224
1) Gastrostomy Feeding	0	by Informal Support	225
	0	by PATH Home Program	226
	0	by Other Provider	227
1) Heat Treatments	0	by Informal Support	228
	0	by PATH Home Program	229
	0	by Other Provider	230
61) Nasogastric Feeding	0	by Informal Support	231
	0	by PATH Home Program	232
	0	by Other Provider	233
61) Nursing Monitoring	0	by Informal Support	234
	19	by PATH Home Program	235
	0	by Other Provider	236
61) Ostomy Care	0	by Informal Support	237
	0	by PATH Home Program	238
	0	by Other Provider	239
61) Oxygen Therapy	0	by Informal Support	240
	0	by PATH Home Program	241
	0	by Other Provider	242
61) Pain Control - Severe	0	by Informal Support	243
	0	by PATH Home Program	244
	0	by Other Provider	245
61) Parenteral Feeding	0	by Informal Support	246
	0	by PATH Home Program	247

TURNAROUND DATE: 03-20-1986
AGENCY: Visiting Nurse Association of Albany, Inc.
CLIENT IDENTIFIER: 1374727

ASSESSOR ID #: 1101
ASSESSOR: Lansburg
PROJECT ID: 110207

RCODE	QUESTION	RESPONSE		ITEM#
		0	by Other Provider	248
	61) Radiation Treatments	0	by Informal Support	249
		0	by PATH Home Program	250
		0	by Other Provider	251
	61) Range of Motion	0	by Informal Support	252
		0	by PATH Home Program	253
		0	by Other Provider	254
	61) Inhalation Therapy	0	by Informal Support	255
		0	by PATH Home Program	256
		0	by Other Provider	257
	61) Specimen Collection	0	by Informal Support	258
		0	by PATH Home Program	259
		0	by Other Provider	260
	61) Suctioning	0	by Informal Support	261
		0	by PATH Home Program	262
		0	by Other Provider	263
	61) Tracheostomy Care	0	by Informal Support	264
		0	by PATH Home Program	265
		0	by Other Provider	266
	61) Transfusions	0	by Informal Support	267
		0	by PATH Home Program	268
		0	by Other Provider	269
	61) Wound Care - Aseptic	0	by Informal Support	270
		0	by PATH Home Program	271
		0	by Other Provider	272
	61) Wound Care - Nonaseptic	0	by Informal Support	273
		0	by PATH Home Program	274
		0	by Other Provider	275
	61) Other Treatment	0	by Informal Support	276
		0	by PATH Home Program	277
		0	by Other Provider	278
	62) ADL's, Hours	0		279
	62) 1.Bathing		Not by Informal Support	280
			Not by PATH In-Home Program	281
			Not by Other In-Home Provider	282
	62) 2.Dressing		Not by Informal Support	283
			Not by PATH In-Home Program	284
			Not by Other In-Home Provider	285
	62) 3.Grooming		Not by Informal Support	286
			Not by PATH In-Home Program	287
			Not by Other In-Home Provider	288
	62) 4.Toileting		Not by Informal Support	289
			Not by PATH In-Home Program	290
			Not by Other In-Home Provider	291
	62) 5.Eating/Feeding		Not by Informal Support	292
			Not by PATH In-Home Program	293
			Not by Other In-Home Provider	294
	62) 6.Mobility Assistance		Not by Informal Support	295
			Not by PATH In-Home Program	296
			Not by Other In-Home Provider	297
	62) 7.Transferring		Not by Informal Support	298
			Not by PATH In-Home Program	299

Figure III.I

TURNAROUND DOCUMENT RESPONSE MODIFICATION FORM

AGENCY: Visiting Nurse Association of Albany, Inc.

PATH DATE: 0 1 2 9 8 6 (1-6)

PRIMARY ASSESSOR: 0 1 1 0 1 (7-11)

CLIENT ID: 1 3 7 4 7 2 7 (12-22)

IONS: MAKE ALL ENTRIES IN RED. ENTER A B TO CHANGE A RESPONSE TO BLANK.
N THE CURRENT RESPONSE FOR THAT FIELD, ENTER THAT RESPONSE.

QUESTION	ITEM#	NEW RESPONSE
67) Date Service Initiated	3 8 7 (23-25)	(26-36)
68) Service Status	3 8 8 (37-39)	(40-50)
ENTER ANY ADDITIONAL CHANGES TO THE RIGHT (INSERT ITEM NUMBER AS WELL AS NEW RESPONSE) --------->	(51-53)	(54-64)
	(65-67)	(68-78)
	(79-81)	(82-92)
	(93-95)	(96-106)
	(107-109)	(110-120)
	(121-123)	(124-134)
	(135-137)	(138-148)
	(149-151)	(152-162)
	(163-165)	(166-176)
	(177-179)	(180-190)
	(191-193)	(194-204)

TURNAROUND DOCUMENT RESPONSE MODIFICATION FORM

:TIONS: MAKE ALL ENTRIES IN RED. ENTER A B TO CHANGE A RESPONSE TO BLANK.
IN THE CURRENT RESPONSE FOR THAT FIELD, ENTER THAT RESPONSE.

QUESTION

ENTER ANY ADDITIONAL CHANGES TO THE RIGHT ==========>
(INSERT ITEM NUMBER AS WELL AS NEW RESPONSE)

70

AGENCY: Visiting Nurse Association of Albany, Inc.

PATH DATE |0|1|2|9|8|6| (1-6)

PRIMARY ASSESSOR: |0|1|1|0|1| (7-11)

CLIENT ID: |1|3|7|4|7|2|7|_|_|_|_| (12-22)

ITEM#	NEW RESPONSE
|_|_|_| 23- 25	|_|_|_|_|_|_|_|_|_|_|_| 26- 36
|_|_|_| 37- 39	|_|_|_|_|_|_|_|_|_|_|_| 40- 50
|_|_|_| 51- 53	|_|_|_|_|_|_|_|_|_|_|_| 54- 64
|_|_|_| 65- 67	|_|_|_|_|_|_|_|_|_|_|_| 68- 78
|_|_|_| 79- 81	|_|_|_|_|_|_|_|_|_|_|_| 82- 92
|_|_|_| 93- 95	|_|_|_|_|_|_|_|_|_|_|_| 96-106
|_|_|_| 107-109	|_|_|_|_|_|_|_|_|_|_|_| 110-120
|_|_|_| 121-123	|_|_|_|_|_|_|_|_|_|_|_| 124-134
|_|_|_| 135-137	|_|_|_|_|_|_|_|_|_|_|_| 138-148
|_|_|_| 149-151	|_|_|_|_|_|_|_|_|_|_|_| 152-162
|_|_|_| 163-165	|_|_|_|_|_|_|_|_|_|_|_| 166-176
|_|_|_| 177-179	|_|_|_|_|_|_|_|_|_|_|_| 180-190
|_|_|_| 191-193	|_|_|_|_|_|_|_|_|_|_|_| 194-204

- Left justify all entries.
- Although a Client Identifier may be corrected using the form, the original Client Identifier must be used to refer to the client throughout the form.
- Enter only whole numbers. No fractions or decimals are allowed.
- Entries of dates must include hyphens. For Date of Birth, 4 digits must be used to enter the year while only 2 digits are used for the year of any other dates.
- ICD-9 codes must be entered exactly as they read and include the period.

Of the forms used in the data collection, the Response Modification Form proved to be the most difficult for assessors to contend with. It was very much a 'data processing' oriented form.

Unlike the PATH with specific spaces provided for a single response, the Response Modification Form, because it had to be applicable to any question, had a format which required the assessor to follow a set of written instructions to make entries rather than follow a path the format determined. The availability of both a hotline for questions as well as the ability to schedule an on-site visit by a Project Nurse to explain the Form proved valuable.

The Data Quality Assurance steps taken consisting of a system of computer checks, assessor review, and data correction enhanced the validity of the data base beyond that possible with the original submitted data.

III.F DATA COLLECTION TIMETABLE.

The time for data collection activities spanned eight months. A timetable of the activities follows.

Time period	Event
Oct 1985 to Dec 1985	- Pilot testing of PATH in six agencies
Early Dec	- First agency trained - Field test of PATH
Jan. 6-17	- All agencies trained
Jan. 1986	- Data collection started (each agency started after it was trained) - Hotline available to agencies - Procedure modifications sent to agencies - Project nurse visits scheduled during early data collection period

April 1986	- Data collection ends - Turnaround document and data modification forms sent to all agencies - Project nurse visits selected agencies to answer turnaround questions
April to May 1986	- Completed data modification forms returned to RPI PATH - Database updated periodically
June 1986	- Final PATH database update - Agency profiles sent to all agencies

IV. THE PATH DATABASE

IV.A. COMPOSITION OF THE PATH DATABASE

A total of 2425 usable PATHs were collected and entered into the database. These PATHs came from a variety of agencies representing patients in 5 different home care programs across the State. For 328 CHHA patients, there were two PATHs in the database; one at entrance, into the agency and a second at 3 to 4 weeks after admission to the agency (See Figure IV.A).

A total of 1075 PATHs of persons receiving home care under the Personal Care Home Attendant Program are included in the database; other home care programs have lower representation. The geographical location of these clients is presented in Table IV.1. and Figure IV.B.

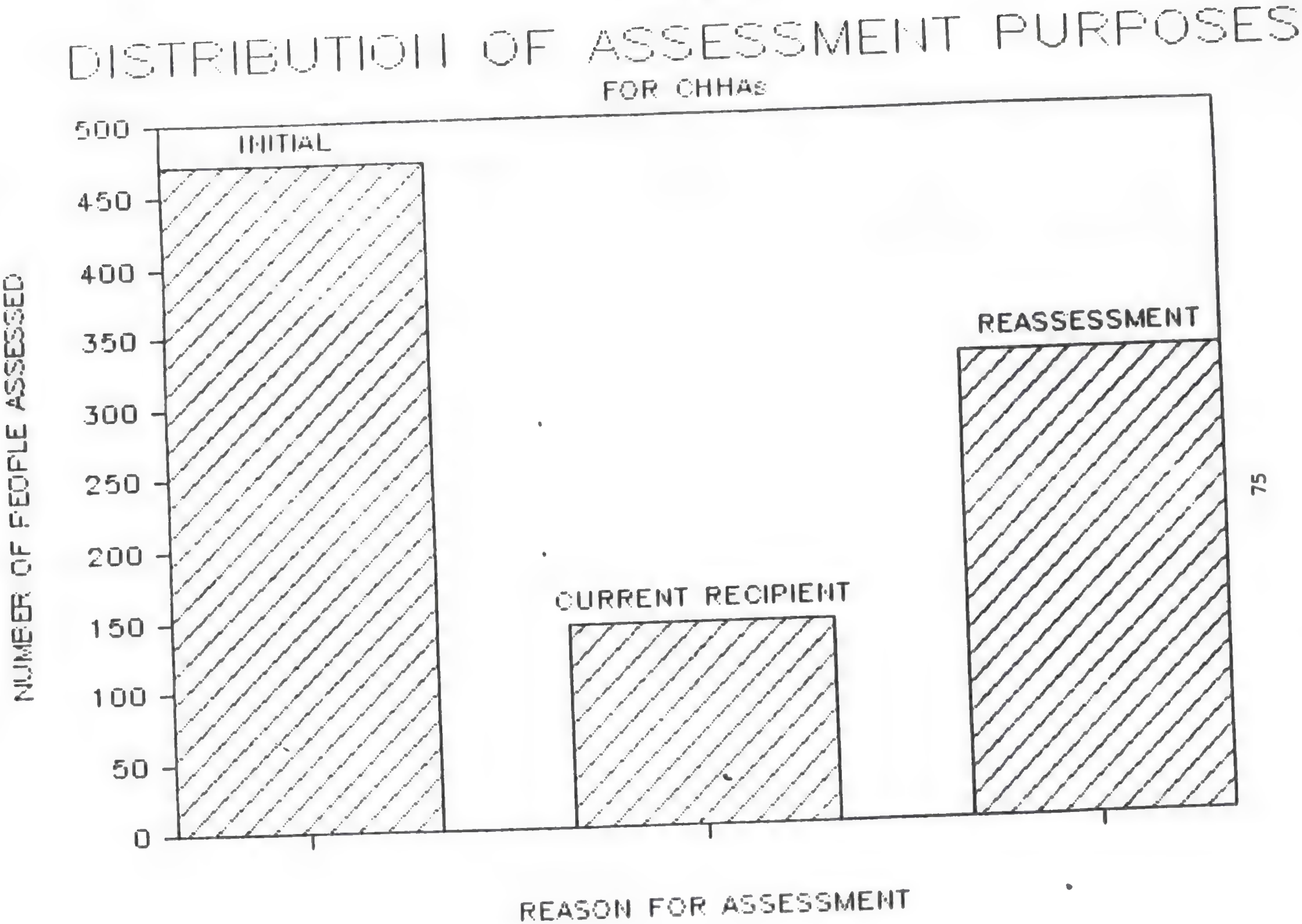
Table IV.1

Program and Geographical Source of PATHs

Program	All	Geographic Region: New York City	Metropolitan Region, NYC[1]	Upstate New York
Personal Care/ Home Attendant	1075	721	119	235
Certified Home Health Agency	942	436	106	400
Long Term Home Health Care Program	317	191	39	87
Community Service for Elderly Program	43	-	22	21
Unlicensed Providers[2]	48	-	2	46
All	2425	1348	288	789

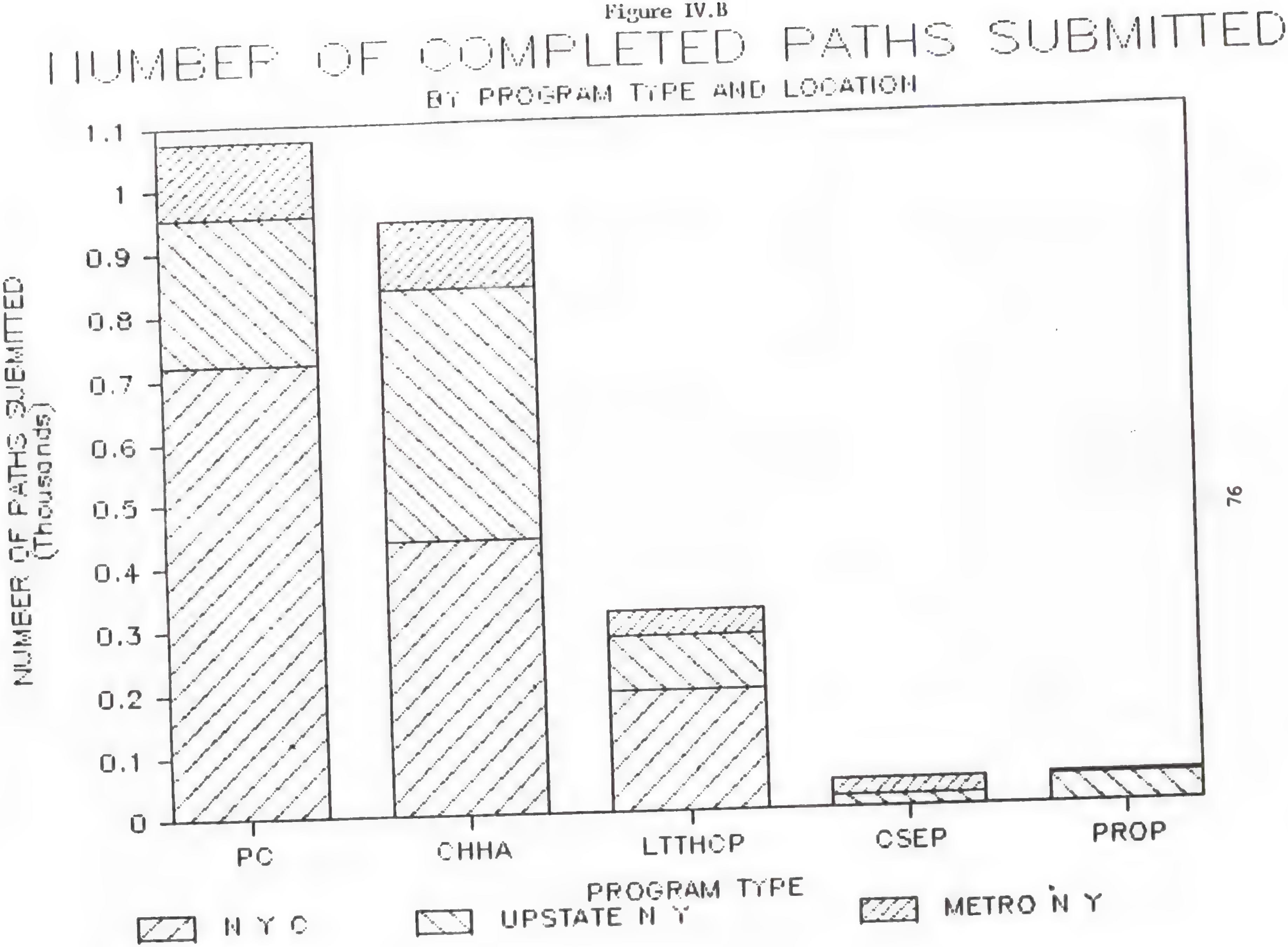
1. Metropolitan Region is defined as those counties abutting New York City.
2. Over 120 PATHs were completed by Unlicensed Home Care Provider (Proprietary Home Care Agency) staff. Many of these patients were clients under the Personal Care/Home Attendant program and they are counted under that program type.

Figure IV.A



75

Figure IV.B


NUMBER OF COMPLETED PATHS SUBMITTED
BY PROGRAM TYPE AND LOCATION
NUMBER OF PATHS SUBMITTED (Thousands)
1.1
1
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
PC
CHHA
LTTHCP
CSEP
PROP
PROGRAM TYPE
N Y C
UPSTATE N Y
METRO N Y

A mixed geographical representation is reflected in the database with 55.6 percent of all PATHs from New York City. It is worth noting that in terms of number of persons receiving home services and cost of these services, New York City as a percentage of Statewide home care statistics is higher than the PATH database proportion.

IV.B. PROFILE OF PATIENTS

A first step of analysis is to review the frequency of the responses to each question. This early stage analysis allows identification of patient characteristics which are the same for many patients and the identification of characteristics which are present in only a few patients.

Observations of both types are important in the development of a classification system. In this section, a profile of patients (as captured in the PATH database) by question level by home care program type is presented.

These profiles are presented as tables which report the percent of patients in the program type with the respective response. Patient characteristics are presented in the order that they appear on the PATH under major categories of

- Assessment of Client Condition
- Activities of Daily Living
- Instrumental Activities of Daily Living
- Cognitive and Behavioral Functioning

The particular question number for which the distribution of responses is presented is referenced in each table. The table contains an 'acronym' for the full PATH response. The full response can be found by using this 'acronym' to crosswalk to the PATH instrument. Comparison of the data across program types is reserved for a later chapter. Because of the size of these tables, they appear on separate pages following discussion of the responses.

IV.B.1 Assessment of client condition

The client condition questions are questions 17 through 25 on the PATH. The responses to these questions are presented in Table IV.2. The data shows that a large variety of conditions affect patients in the database. While for some questions such as those dealing with the communication skills of patients, a majority of patients have little if any impairment, other characterisitics show no dominant pattern.

IV.B.2 Activities of daily living.

The Activities of Daily Living (ADL) questions are questions 26 through 35 of the PATH. The responses for these questions are presented in Table IV.3.

The data show that for most ADL questions, PATH patients have a low level of functioning impairment and the patient is most commonly independent in the activity. The exceptions to this pattern are the three ADLs of Dressing, Personal Hygiene and Bathing (Questions 29, 30 and 31 respectively). The level of functioning of patients on these three dimensions is spread among all available responses. It is worth noting that these ADLs are also related activities and the responses would be expected to be highly correlated. The data show that patients in home care have good control over bowel and bladder function.

IV.B.3 Instrumental Activities of Daily Living

The Instrumental Activities of Daily Living (IADL) questions are PATH questions 36A through 36G with multiple questions under some question numbers. The responses for these questions are presented in Table IV.4.

For the IADL questions, a high level of diversity of response is present within a single question and between IADL questions. For example, a high number of people are independent with respect to Money Management while very few are independent in Shopping. Complicating the profile of IADL status of patients is the reponse 'Not Applicable' for these questions. A retrospective review of what this response might mean for a question such as telephone use revealed that 'Not' Applicable' could apply to the following very unequal situations:

- No phone is accessible
- Client is comatose and telephone use has no meaning
- Client resides in a supervised setting and summoning assistance does not require use of a telephone.
- Another person handles all telephone matters for the patient and the patient has no need to use the telephone.

From a classification perspective, the response 'Not Applicable' is not useful.

IV.B.4 Cognitive and behavioral functioning

PATH questions 37 through 48 assess the Cognitive and Behavioral Functioning of patients. Table IV.5 contains the distribution of responses to these questions.

The data show that many patients have no problems in either their cognitive ability or behavior patterns. The area where patients are the least problem free are in memory and impaired decision making and yet a majority of patients present no problem with either. The area with the second highest problem level is orientation both inside and outside of the home.

Table IV.2
Patient Profile By Program Type
for Client Condition PATH Questions
(Question 13 through 25)

Question/Number	Response	Personal Care Home Attendant	Program Type Certified Home Health	Long Term Home Health Care
		%		
Referral Reason	13 Illn-Hosp-No Surg	6.7%	32.2%	15.5%
	Illn-Hosp	2.4%	27.1%	6.9%
	Illn-no Hosp Surg	0.8%	4.0%	0.9%
	Flare-Hosp	2.5%	16.4%	11.4%
	Flare-no Hosp	3.2%	4.7%	4.7%
	Prog. Deterior.	23.8%	7.7%	9.5%
	Gen. Deterior.	55.0%	5.6%	33.8%
	Red. Mental	1.9%	0.1%	1.6%
	Psychosocial Dysfn.	0.7%	0.1%	0.6%
	Suppl. inform supp.	2.0%	0.6%	7.9%
	Other	1.1%	1.5%	7.3%
Goal	14 Return to funct.	1.2%	39.7%	0.9%
	Discontinue HC	1.9%	32.0%	6.9%
	Maintain HC	95.3%	20.4%	90.9%
	Support End Stage	1.6%	7.9%	1.3%
Duration Dx	15 <3 mo.	2.4%	43.8%	4.1%
	3-6 mo.	2.3%	14.1%	2.1%
	6-12 mo.	3.1%	8.0%	5.0%
	1-5 yr.	25.0%	17.5%	29.5%
	>5 yr.	67.2%	16.7%	59.3%
Care Factors	16 Angina	15.3%	15.2%	23.1%
	Bleeding - int.	1.0%	7.1%	5.8%
	Comatose	0.0%	1.0%	1.6%
	Dehydration	0.7%	4.9%	2.3%
	Dyspnea	29.5%	27.9%	26.1%
	Edema-pitt.	17.2%	25.6%	20.3%
	Falls	17.3%	19.6%	21.5%
	Hyper/Hypoglyc.	3.8%	14.4%	21.5%
	Ostomy	0.7%	4.4%	3.3%
	Pain	16.0%	18.1%	9.8%
	Stasis Ulcer	2.4%	6.7%	5.8%
	Syncope	10.5%	7.3%	5.5%
	Terminal	1.7%	13.2%	4.9%
	Tracheostomy	0.0%	0.7%	1.6%
	Vent/respirator	0.3%	0.1%	1.6%
	Wound infect	1.4%	11.4%	6.2%

Table IV.2 Continued.

Extremities (any disabil)	17 Amputation	3.3%	5.2%	6.3%
	Brace	3.8%	7.9%	8.2%
	Contractures	7.4%	6.6%	11.7%
	Fx	5.4%	8.9%	6.0%
	Joint Repl.	3.4%	4.0%	4.4%
	Lymphedema	1.4%	3.8%	1.9%
	Paralysis	8.7%	6.4%	9.5%
	Paresis	14.0%	20.8%	15.5%
Decubitus	18-None	90.9%	86.6%	93.4%
	Grade 1	5.5%	3.4%	1.9%
	Grade 2	1.2%	4.0%	1.9%
	Grade 3	2.0%	4.3%	2.2%
	Grade 4	0.4%	1.7%	0.6%
Expressive	21 Speaks and Underst.	90.8%	87.2%	81.7%
	Speaks, Underst dif	4.3%	7.0%	10.1%
	Sign language	0.7%	0.3%	0.6%
	Gestures	1.8%	2.5%	3.5%
	Cannot convey needs	2.4%	3.0%	4.1%
Receptive Comm.	22 Generally understan	91.2%	86.9%	78.5%
	Limited comprehens	5.7%	9.1%	16.7%
	No communic.	0.1%	0.3%	0.0%
	Primitive gestures	0.9%	1.0%	1.6%
	Unable to underst	0.6%	0.6%	0.6%
	Not indicated	1.5%	2.0%	2.5%
Hearing-voices	23 Adequate	73.9%	76.4%	68.1%
	Trouble in gps.	13.6%	11.5%	16.6%
	Moderate loss	10.0%	11.3%	12.7%
	Severe/Total loss	2.4%	0.8%	2.6%
Hearing-sounds	24 Hears	90.3%	90.1%	85.7%
	Difficult/unable	9.7%	9.9%	14.3%
		100.0%	100.0%	100.00%
Vision	25 Sees well	44.6%	50.9%	33.3%
	Adequate	38.6%	36.3%	45.3%
	Moderate loss	10.7%	10.6%	15.9%
	Sever/tot loss <1yr	2.0%	1.2%	2.6%
	Sever/tot loss >1yr	4.2%	1.0%	2.9%

Table IV.3
Patient Profile By Program Type
for Activities of Daily Living PATH Questions
(Questions 26 through 35)

Question/ Number		Response	Program Type: Personal Care Home Attendant	Program Type: Certified Home Health	Program Type: Long Term Home Health
Eating	26	Indep	77.7%	68.5%	58.4%
		w/ equip	1.1%	1.5%	1.9%
		Intermit. superv/as	12.3%	16.5%	18.9%
		Contin. superv.	2.6%	2.4%	5.0%
		Contin. assist	2.7%	5.5%	11.0%
		By hand	3.5%	3.4%	4.4%
		Tube/Parenteral	0.1%	2.1%	0.3%
Mobility	27	Walks indep.	24.0%	26.0%	16.8%
		Walks - w/ device	32.8%	26.5%	32.6%
		Walks - interm. sup	16.3%	15.8%	23.1%
		Walks - contin supe	6.3%	7.2%	5.7%
		Walks - cont assis	8.2%	7.7%	4.1%
		Wheels indep.	4.4%	3.4%	5.1%
		Is wheeled	3.8%	5.3%	4.4%
		Chairfast	2.3%	5.8%	6.6%
		Bedfast	1.8%	2.2%	1.6%
Transfer	28	Indep	52.3%	41.0%	48.9%
		Indep -w/ equip	16.3%	14.0%	16.7%
		Interm. superv	11.2%	18.6%	11.7%
		Cont. superv	3.4%	5.7%	5.4%
		Cont. assist - 1pe	12.3%	10.5%	6.9%
		Cont. Assist - >1 p	2.8%	8.6%	8.5%
		Bedfast	1.7%	1.6%	1.9%
Dressing	29	Indep	37.0%	37.2%	24.0%
		Interm. superv	28.0%	28.9%	34.4%
		Cont. superv	9.6%	6.2%	9.1%
		Cont. assist	15.9%	13.8%	18.0%
		Total Assist	6.9%	7.5%	12.3%
		Bedgown	2.6%	6.5%	2.2%
Pers. Hyg.	30	Indep	39.0%	35.7%	25.6%
		Interm. superv	30.0%	33.8%	38.2%
		Cont. superv	6.1%	3.7%	5.4%
		Cont. assist	14.7%	15.0%	18.0%
		Total Assist	10.1%	11.8%	12.9%

TABLE IV.3 Continued

Bathing	31	Indep	15.7%	22.4%	7.3%
		Indep w/ equip	8.0%	5.9%	6.6%
		Min. superv	36.9%	34.9%	36.6%
		Cont. superv	8.2%	5.1%	6.6%
		Cont. assist	20.1%	19.4%	27.4%
		Total Assist	11.0%	12.2%	15.5%
Toileting	31	Indep	52.1%	44.7%	41.0%
		Indep w/ equip	14.7%	14.3%	22.7%
		Intermitt superv/as	10.5%	14.3%	9.8%
		Contin superv	1.8%	1.3%	0.6%
		Cont Assist	10.9%	13.1%	12.0%
		Total Assist	3.7%	4.7%	4.1%
		Incontinent- no toil	5.1%	6.6%	6.9%
		Incontinent- toil	1.3%	1.1%	2.8%
Bladder Ctrl-Day					
	33	Contin	82.5%	81.1%	71.1%
		Occas. incont	6.6%	6.7%	12.3%
		Freq/totally incont	8.8%	8.9%	12.3%
		Catheter/self	0.4%	0.9%	1.0%
		Cather/not self	1.7%	1.6%	3.2%
		External Cath			
Ostomy/Cath					
	34	Indwell - self	4.5%	8.5%	91.7%
		Indwell - not self	77.3%	80.9%	0.0%
		Ostomy - self	9.1%	3.2%	8.3%
		Ostomy - not self	9.1%	7.4%	0.0%
Bowel	35	Continent	88.5%	79.4%	91.7%
		Occas. Incont	4.3%	7.2%	81.1%
		Freq./ypy. incont	6.4%	10.2%	10.7%
		Ostomy - self	0.4%	0.7%	0.3%
		Ostomy - not self	0.4%	2.4%	0.9%

Table IV.4
Patient Profile by Program Type
for Instrumental Activities of Daily Living PATH Questions
(Questions 36A through 36G)

Question/ Number	Response	Personal Care Home Attendant	Program Type Certified Home Health	Long Term Home Health
Telephone-an	36A Not Applicable	6.9%	11.0%	8.3%
	Indep	85.1%	78.8%	81.9%
	Superv/assist	5.5%	6.7%	5.5%
	Cont. superv	0.4%	0.4%	0.4%
Teleph-calls	36A Not Applicable	6.6%	12.0%	6.4%
	Indep	81.1%	77.0%	76.7%
	Superv/assist	7.7%	7.7%	13.1%
	Cont. superv	0.8%	0.6%	0.8%
	Cont. assist	3.8%	2.8%	3.0%
Transport-publ	36B Not Applicable	48.4%	61.8%	66.2%
	Indep	14.4%	16.0%	9.3%
	Superv/assist	20.5%	11.3%	9.7%
	Cont. superv	3.1%	3.7%	1.9%
	Cont. assist	13.6%	7.1%	13.0%
Transport-private	36B Not Applicable	5.7%	21.0%	17.7%
	Indep	21.1%	23.6%	15.5%
	Superv/assist	34.3%	21.2%	24.5%
	Cont. superv	7.9%	6.7%	4.1%
	Cont. assist	31.1%	27.5%	38.2%
Meal Prep-light	36C Not Applicable	2.4%	11.8%	2.6%
	Indep	75.0%	58.1%	58.5%
	Superv/assist	13.5%	19.5%	20.7%
	Cont. superv	1.5%	1.9%	3.6%
	Cont. asssist	7.7%	8.7%	14.5%
Meal Prep-cooks	36C Not Applicable	4.1%	17.9%	0.8%
	Indep	43.9%	34.2%	25.0%
	Superv/assist	27.3%	27.5%	36.7%
	Cont. supery	2.9%	2.5%	4.7%
	Cont. assist	21.8%	17.9%	32.8%
Housework-light	36D Not Applicable	1.9%	21.1%	2.7%
	Indep	69.1%	47.6%	28.3%
	Superv/assist	12.7%	18.8%	30.1%
	Cont. superv	1.3%	1.5%	3.5%
	Cont. assist	15.0%	11.0%	35.4%

Table IV.4 Continued

Housework-heavy	36D Not Applicable	35.4%	43.4%	2.9%
	Indep	3.1%	14.8%	2.9%
	Superv/assist	26.0%	19.2%	11.4%
	Cont. superv	3.1%	2.7%	8.6%
	Cont. assist	32.3%	19.8%	74.3%
Laundry	36D Not Applicable	9.0%	34.4%	2.2%
	Indep	17.0%	25.8%	8.7%
	Superv/assist	27.0%	20.1%	32.6%
	Cont. superv	6.0%	1.4%	4.3%
	Cont. assist	41.0%	18.2%	52.2%
Money Mgt	36E Not Applicable	1.8%	14.5%	2.4%
	Indep	63.4%	64.6%	57.6%
	Superv/assist	24.7%	10.1%	22.9%
	Cont. superv	3.2%	1.7%	2.0%
	Cont. assist	6.8%	9.1%	15.1%
Shopping	36F Not Applicable	2.6%	28.8%	1.4%
	Indep	5.8%	23.3%	12.3%
	Superv/assist	40.9%	21.4%	24.7%
	Cont. superv	4.5%	4.2%	5.5%
	Cont. assist	46.1%	22.3%	56.2%
Appts	36G Not Applicable	2.0%	6.1%	2.8%
	Indep	58.7%	53.8%	44.1%
	Superv/assist	24.2%	21.0%	27.4%
	Cont. superv	1.9%	3.6%	2.2%
	Cont. assist	13.1%	15.5%	23.5%

Table IV. 5
Patient Profile By Program Type
for Cognitive and Behavioral Functioning PATH Questions
(Questions 37 through 48)

Question/ Number		Response	Personal Care Home Attendant	Program Type Certified Home Health	Long Term Home Health
Orient/inside	37	Clear	78.9%	77.7%	72.1%
		Occas. disorient	8.0%	10.1%	10.7%
		Freq. Disorient	3.2%	3.6%	2.9%
		Daily disorient	5.9%	6.6%	10.1%
		Total disorient	4.0%	2.1%	4.2%
Orient/outside	37	Clear	80.5%	79.9%	73.0%
		Occas. disorient	7.6%	8.6%	9.7%
		Freq. Disorient	2.6%	3.1%	2.8%
		Daily disorient	5.6%	6.5%	8.0%
		Total disorient	3.8%	1.9%	6.6%
Wandering	38	Does not wander	96.4%	96.6%	94.3%
		Occasional w/in h	0.9%	1.6%	3.2%
		Freq. within home	1.8%	1.7%	1.9%
		Outside	0.8%	0.1%	0.6%
Memory deficit	41	Not forgetfull	64.9%	67.5%	55.5%
		Occas. forgetfull	17.7%	19.4%	23.6%
		Freq. Forgetfull	7.9%	5.8%	8.2%
		Daily	9.4%	7.2%	12.7%
Decision making	42	Appropriate	72.9%	76.4%	53.7%
		Occasional	12.6%	13.3%	24.7%
		Freq. episodes	4.6%	4.4%	7.7%
		Daily	10.0%	5.9%	13.9%
Verbal disrupt	44	None	95.1%	93.0%	91.8%
		Non-disrupt	0.9%	1.9%	1.9%
		Predictable	1.7%	1.4%	2.5%
		Unpredictable	0.8%	0.7%	1.6%
		Daily	0.9%	1.4%	0.9%
Physical aggress	45	None	98.3%	96.8%	98.1%
		Non-discrupt	0.4%	1.7%	0.0%
		Occasional	0.4%	0.5%	0.6%
		Unpredictable	0.3%	0.4%	0.0%
		Daily	0.5%	0.0%	0.0%

TABLE IV.5 Continued

Infantile/ imappro	46	None	98.6%	96.8%	98.4%
		Non-disrupt	0.4%	1.5%	0.0%
		Occasional	0.3%	0.5%	0.6%
		Predictable	0.1%	0.7%	0.3%
		Unpredictable	0.1%	0.2%	0.3%
		Daily	0.6%	0.2%	0.3%
Depress	47	None	96.1%	88.7%	89.6%
		Non-disrupt	1.5%	5.7%	6.0%
		Occasional	1.0%	1.4%	2.2%
		Predictable	0.6%	1.0%	0.6%
		Unpredictable	0.2%	1.1%	0.9%
		Daily	0.7%	2.1%	0.6%
Phobias	48	None	98.9%	97.7%	99.1%
		Non-disrupt	0.5%	1.4%	0.3%
		Occasional	0.2%	0.2%	0.0%
		Predictable	0.2%	0.2%	0.6%
		Unpredictable	0.2%	0.0%	0.0%
		Daily	0.1%	0.4%	0.0%
Paran/delusions		None	97.8%	96.8%	95.9%
		Non-disrupt	0.7%	2.0%	0.9%
		Occasional	0.5%	0.6%	1.3%
		Predictable	0.2%	0.0%	1.3%
		Unpredictable	0.5%	0.1%	0.3%
		Daily	0.4%	0.4%	0.3%
Hallucin		None	97.6%	97.3%	95.9%
		Non-disrupt	0.7%	1.5%	0.6%
		Occasional	0.7%	0.3%	1.6%
		Predictable	0.1%	0.1%	0.3%
		Unpredictable	0.4%	0.5%	0.3%
		Daily	0.6%	0.2%	0.6%
Withdrawn		None	98.1%	97.1%	97.2%
		Non-disrupt	0.5%	1.7%	1.9%
		Occasional	0.2%	0.4%	0.0%
		Predictable	0.2%	0.1%	0.0%
		Unpredictable	0.4%	0.1%	0.0%
		Daily	0.7%	0.5%	0.9%

V. CLASSIFICATION DEVELOPMENT ISSUES

A classification system for any object is first and foremost a description of that object. By providing a classification system, objects can be described and compared. Without a classification system, both of these activities would be difficult. Consider a simple classification of the color of an object. Without the descriptive capacity of naming the color of an object, comparison between objects would be difficult.

Besides being descriptive, classification systems are designed to meet a purpose. Classifications developed for the same set of objects will be different because of these different purposes. Classifications generally work best when used for the purpose for which they are designed. It is possible to design multipurpose classifications if these purposes are known beforehand and a principle of serving these purposes is followed. In this section, the issues of classification development as applied to this research are discussed.

V.A <u>CLASSIFICATION REQUIREMENTS</u>

Requirements of a classification include:

- Makes sense to those who are to use it.
- Achieves the purpose(s) (or goal(s)) stated for it.
- Has mutually exclusive categories.
- Uses a clear set of standards or language to discriminate between categories.

There are several different types of patient classification systems that can be designed. Among the types are:

- <u>Full Enumeration or Description Systems</u>. All important dimensions are individually described and used collectively to describe an object on a dimension by dimension basis. These systems are used where there are few dimensions of an object and few descriptive terms for each dimension.

- <u>Single Dimension Classification</u>. The purpose of the classification is to characterize a single dimension and mutually exclusive descriptors are defined for that one dimension.

- <u>Indicator Classifications</u>. Patients are assigned to a group in the classification system based on values of indicators. An indicator is a patient characteristic whose purpose is the assignment of a patient to a group and may be a composite measure of several patient dimensions. The characteristic is called an indicator because by measuring and using it, other characteristics are also measured because of the correlation between the characteristics. The RUG-II classification for nursing home patients is an indicator classification system.

The goals set for the home care classification were to:

- Identify and cluster patient health care needs for purposes of structuring the delivery of home health and ADL/IADL services.
- Serve as a basis for development of a screening instrument to direct patients to the most appropriate home care program.
- Be part of an assessment process which leads to the determination of an efficient and appropriate amount of services.

These goals are the purposes of the classification. Within these purposes, there are several objectives which can be defined which serve as design targets for the classification:

- Resource Measurement. The classification system should measure resource consumption more accurately than any other system.
- Resource Type Use Discrimination. The classification system should discriminate between the different types of home care service personnel used to care for the patient.
- Clinical Meaningfulness. The system should be respected by clinicians as one which can be understood within a generally accepted clinical framework.
- Reliability. The classification should be based on patient characteristics which generally can be assessed accurately. Accuracy at the characteristic level leads to reliability of the classification.
- Improved Understanding of Home Delivered Service System. Classification of patients within the system should aid providers, regulators, and researchers in their understanding of the types of patients cared for, their relative cost, mix of service need, and the efficiency of different home care program placements. Information systems using the classification should be usable for many purposes.

V.B. CLASSIFICATION DERIVATION METHODOLOGY

Once data has been collected, the separate elements (characteristics) have to be related in order to create a classification system. The process is one of design and involves decisions at many different stages. Criteria developed to guide these decisions which address the broad objectives of the classification are presented below.

- Statistical explanation. One of the major criteria in the derivation process was how well the chosen variable(s) explained variation in relative resource use within the sample.

- Clinical validity. The clinical meaningfulness of the groups was also stressed. Do the groups make sense both clinically and administratively in terms of their care needs?

- Resident homogeneity. Residents in individual groups should appear to be similar in terms of their resource utilization. There should be a relatively narrow variation in resource use recorded between the highs and lows of each group and little overlapping between groups.

- Optimal number of groups. Fewer groups should be created to avoid administration difficulties. Yet, the number of groups should be sufficient to encompass major identifiable clinical groups with all residents classified into one and only one category.

- Ease of use. The resulting system should be understandable and relatively easy to use for both providers and those responsible for review and audit.

- Flexibility. The structure of the classification system should lend itself to easy revision and refinement as new developments in the home care field occur.

- Broad applicability. The classification system should provide structure and meaning to a set of elements which appear diverse. The structure should be useful for analysis of elements of home care management such as quality of care, staffing/manpower planning, utilization review, etc. To be most fruitful, the developed classification system should be representative of the nature of the population in terms broader than just resource consumption.

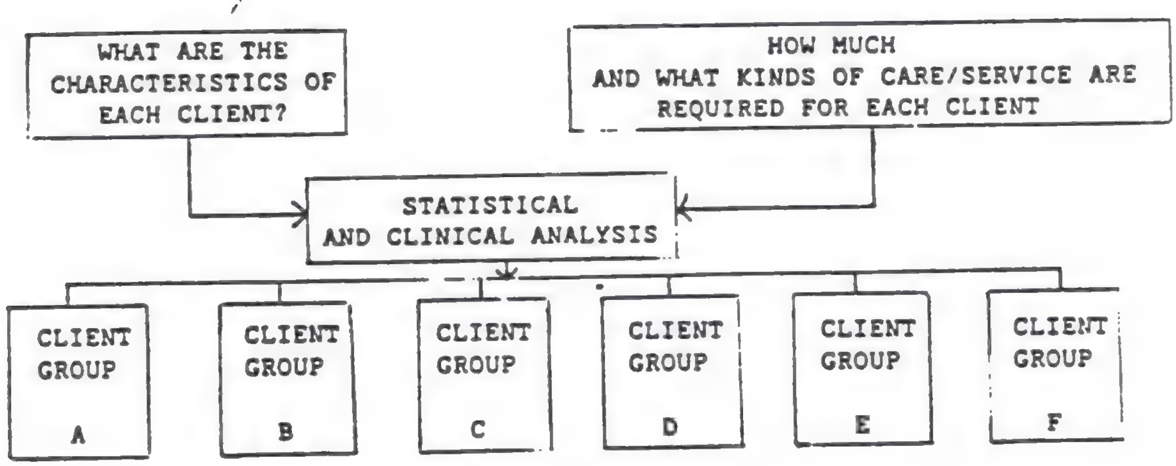
- RUG-II Similarity. Similarity with the RUG-II classification system should be incorporated. In this manner, comparison between patients in both settings can be made.

A simple pictoral representation of the derivation process is presented in Figure V.A. Client groups described by certain characteristics (e.g., functional status, medical condition) will be formed according to clinical and resource use differences; that is, the groups will be chosen so that there is as much difference as possible between one group and the next.

Figure V.A

HOW A CLIENT CLASSIFICATION SYSTEM

IS DEVELOPED



V.C. INDICATORS

The use of variance explanation as one measure of how well a classification system or a partitioning variable performs means that the independent variable is used to explain differences of the dependent variable between patients. Because of the correlation between independent variables (patient characteristics), the variable is called an indicator variable. An indicator variable reflects a larger group of characteristics because it predicts a certain level of resource consumption. For example, if you know that a child is 18 months old, you can predict that the child can walk but that the child is not yet toilet trained. One characteristic, age, allows you to predict other characteristics of the child.

To understand how an indicator is derived, consider dividing clients into three categories: those who can walk independently, those who need help walking, and those who are bedridden. In this case, being bedridden is an indicator that implies the largest amount of resource needs compared to the other two categories. The least, of course, is required by the client who walks independently. It is not necessary to measure each activity that must be performed in order to take care of a bedfast client to know this; experience shows that the concept is correct.

To derive reliable indicators of resource use, patient characteristics, rather than care tasks, are examined. A reliable indicator will be a client characteristic that accurately predicts the amount of care required. Some characteristics are reliable indicators, while others are not. For instance, diagnosis is not necessarily a reliable indicator. A number of clients may have chronic obstructive pulmonary disease (COPD), but the illness can exist in various stages, each requiring different amounts of care. However, activities of daily living (ADLs), such as transfer, eating, and toileting, turn out to be very reliable indicators for certain client populations. Other characteristics, such as certain clinicial conditions or behavioral problems, are also reliable indicators.

The concept of using indicators to predict resource consumption is the foundation for the creation of a classification system.

V.D. CLINICAL INPUT

An important criterion presented earlier of a patient classification is its clinical meaningfulness. A required input then in the design process is a clinical perspective preferably from a broad base of clinicians who bring with them their individual and collective experiences and perspectives. In this research, because it crossed over five different programs, each with different missions and restrictions, the diversity of patients was wide and need for broad based clinical input was critical.

The definition of groups within a database is a partitioning activity. The statistical procedure used to derive the home care classification system was cluster analysis. AUTOGRP, an inter-active computer software package, was the tool utilized to perform the calculations in this process. The goal of partitioning is to establish clusters or subgroups of the population which result in the variation in resource consumption within the groups being minimized, while the variation between groups is maximized. The intent is to maximize the variance explained by the choice of variables to split the population, by the values of the splitting variables which are grouped together, and by the order in which different variables are applied for splitting. Clinical judgment is an integral component of the process.

AUTOGRP is used to determine whether a client characteristic, referred to as an independent variable, explains any of the variation observed in resource consumption, the dependent variable. For instance, clients who are mobile tend to have low home care consumption while the home care service for clients who are unable to walk tends to be more intense.

AUTOGRP first creates cells using the values assumed by the independent variable and then orders them by their mean resource consumption. Next, the variance contribution is calculated, based on both the variance and the size of the subgroups, in order to determine the most suitable group for partitioning. Initially, the whole population is the group. If the criteria are met for selection, splits of the subgroup are evaluated. Splits which result in the smallest sum of the variance of the subgroups are chosen. The process is repeated until no further splits are possible under the criteria which AUTOGRP operates. The resultant variance explanation is the difference between the variance of the starting group and the sum of the variance of the final subgroups. Only one independent variable can be considered at a time. To determine whether greater variance explanation can be achieved with multiple variables, subgroups formed with one variable can subsequently undergo the process with another independent variable.

Using this recursive partitioning process, the entire population is divided into a number of subgroups of clients with similar resource consumption. An AUTOGRP procedure called a tree is then used to evaluate the overall variance in resource consumption which can be explained by the potential classification system of subgroups. Usually, several systems with numerous modifications are considered before the final version is developed.

To obtain this input, a clinical workgroup composed of representatives from the provider community (all program types) and the regulatory community was convened. The role of this group was to serve as a resource to the research by providing their ideas on classification, reviewing research findings, reacting to material and ideas of the researchers, and to assist in the resolution of research questions.

The forum for providing such input was multifaceted. In the course of two months, the group met four times. The meetings, although structured from an agenda viewpoint, were very open and discussion was free wheeling. Items on the agenda included presentation of data findings, structured exercises, small group discussions on particular research topics, full group discussion on specific topics, wide open discussions on many topics, exchange of material between the group and research staff, and active classification design discussion related to the specification of variables to include and exclude from a classification system.

In addition to the meeting, another forum was telephone and letter communication with group members between scheduled meetings. In many cases, these communications were work group member initiated to followup discussions at the workgroup meetings. In other instances, they were in response to specific requests made to the group at a meeting or in letter to consider the issues and offer solutions to problems.

The relationship that was established with the group was to have them think of themselves as part of the research process. Their ideas would be reviewed, tested, debated, and findings returned. The group functioned well in this role and the classification system reflects the input received from them. A list of group members is presented in the Appendix, Volume 2.

The Workgroup made significant contributions to the development of the classification system by their careful review of presented materials and thoughtful questions. Members offered suggestions for new independent variables combined from existing characteristics. They helped to refine the various elements of the emerging classification strategy as they examined variables with respect to clinical meaningfulness, reliability, manipulability and negative incentives to determine possible inclusion or elimination. Suggestions of useful supplemental analyses were also made. In addition to their own individual input, they discussed major issues with colleagues so that the research benefited from more than just the input of the individual work group member.

V.E. DEPENDENT VARIABLE

The role of the classification as a means to differentiate between patients with different resource concumption pattern requires a definition of a resource use measure. In this research, several different measures were simultaneously considered to aid in the detection of patterns of resource use related to skill levels of caregivers.

One of first resource measures used was the hours of care by skill level. This analysis approach demonstrated that patients exhibited highly variant patterns of resource use. For example, a significant number of patients received a high amount of PT and OT care, and received, on the average, low amounts of aide care. Other patients used only aide care without any skilled care delivered.

A second resource use measures was the sum of hours of care received across all skill levels. In this measure, an hour of aide time was considered equal to an hour of PT time for the calculation.

The third measure of resource use was a total cost expression using hourly charges of each of the skill levels. The expression for calculating this was:

52.57 x (RN Hours + LPN Hours) + 56.61 x (PT Hours) +
60.88 x (OT Hours + ST Hours) + 9.37 x (Home Health Aide Hours) +
6.19 x (Homemaker + Personal Care + Environmental Aide Hours)

This data reflects the wage pattern in New York City. For skilled services, charge data, which was available on a per visit basis, was converted to an hourly basis by using PATH data to find the average length of visits by skill level.

While efforts were made to use unit costs which included the same 'cost items', assurance of this is difficult given the different rate and charge structure of each program. Across program lines, this cost measure may not be on an equal basis because of the relationship between case management activities and direct patient care. For example, in the PC program, assessment and case management are both done by persons not included in the unit cost of the care deliverer, the personal care aide. This is in contrast to the CHHA where all activities and cost are traced back to the visit of the caregiver.

All references and uses of the dependent variables developed for this research should be done with clear recognition of the caveats mentioned above.

VI. DERIVATION OF RUG-HHC

In the previous section, what the classification was supposed to accomplish was discussed. These were stated both as goals and as decision criteria for use during the design process. In this section, derivation of the RUG-HHC system is described.

The description does not necessarily follow the chronological order of the process. The process is described on a basis of topic area. For example, the analysis steps and conclusions of informal support systems are presented in one section.

When using a data base in a classification derivation process, there are several different ways to approach the database. The first section of this chapter presents these approaches. The latter sections are topic coverage of the derivation process.

VI.A CLASSIFICATION DEVELOPMENT APPROACHES.

There are several different analysis approaches to a database. While these approaches are separable, the derivation process is really a mixing of all of the approaches. This mixing is required because no single approach can lead to a classification which has all the desired features and characteristics. Three analysis approaches are described here. The RUG-HHC classification was derived using a combination of each.

VI.A.1 Statistical Approach.

The basic objective of the analysis leading to a classification is to split the population into groups of similar patients which require the same level of resource use. One strategy that can be followed for determining the patient characteristic of choice for a split is a statistical criterion. The patient characteristic which results in the greatest reduction in the unexplained variation of resource use would be selected. If this statistical strategy is followed in successive fashion for both the first splits and subsequent splits, the resulting partition would presumably best explain the resource use differences among the population since the best explanatory characteristic was used at each split level.

There are limiting factors in the number of subsequential splits that can be made:

- The number of observations in a group is small and further splits create spurious statistical relationships rather than a pattern.
- A number of variables surface as having explanatory significance but each explains only a small percentage of the variance and no clear choice of a splitting variable arises.

In addition to these limitations, circumstances arise at each partition point which must be considered within the context of how good a partition is in a classification system.

- Missing responses. Independent variables which had a high number of missing responses surfaced as the maximum variance explanation variable. These results were generally disregarded since only a subset of the population was included in the computation and therefore the resulting high explanation was not valid.

- Ordinal data. Independent variables which were ordinal, i.e. ranked but without measurable intervals, were not ordinally ranked for maximum variance explanation even though logically such ordinality was expected.

- Lack of logical basis. Variables not logically related to resource use can surface as high variance explanatory variables as a result of missing responses, correlation, or coding anomalies. They may be discarded as inappropriate partitioning variables.

One of the limitations of a population partitioning analysis which considers only one variable at a time is that subpopulations which are identifiable by a pattern of responses to more than one question (independent variable) cannot be detected. In addition, a subpopulation characterized by just a relatively few cases indicated by responses to a question will not be readily detected in a partitioning algorithm because they will be dominated by the large numbers of patients without that characteristic.

VI.A.2 Special population partition model.

Simple descriptive statistics of the mean of the dependent variable by response value to all questions on the assessment instrument can reveal that for those few patients with a given response, the mean resource use is quite different from the resource use of patients without that response. These patients can be said to constitute a special population since they are few in number and yet there is a resource use difference.

In a special population strategy, patients with these special conditions would be separated from patients without them through the splitting mechanism in AUTOGRP. The statistical partitioning strategy might then be followed to arrive at the final classification groups.

VI.A.3 Hierarchy model.

This clinically-based strategy provides a clinical structure to the classification. Groups would be identified using judgements as to whether they are clinically or administratively different from one another in terms of resource use. These groups would form the core of the classification system and other characteristics would then be used to differentiate the residents further. These groups would be called the hierarchy groups.

In most cases, there will be more than one condition which when singly present for a patient would lead to placing a patient in one of the hierarchy groups. The conceptual model of a hierarchy relies heavily on recognizing that the conditions are used as indicator variables and homogeneity of a group is not because the conditions are the same but rather that the resource use patterns of patients with the conditions are similar. The RUG-II system for nursing home patients is based on a hierarchy model approach to first partitioning the population.

In the next sections, the derivation process is presented along topic lines. The first two sections present analysis of factors of patients and of the database which impact resource use patterns for patients and which are independent (or near so) of the disability level of the patient. These are the effect of regional location and informal support system.

VI.B <u>REGIONAL EFFECT</u>.

The database was collected in many different regions of the State. Because of this, differences between regions in resource consumption patterns are present. Regional differences can have a high impact on the derivation process. While it is expected that a low care patient in one region will also be low care in another, there will be differences between equivalent patients based only on the regional origin of the patient.

This 'unequal resource to equivalent patient' effect will mean that if the analysis proceeds on the full database, the predictive power of patient characteristics will be diminished since part of the difference being explained is not patient characteristic centered. In some instances, the regional effect may be masking a patient characteristic effect which would be detected had there been no regional effect.

A review of resource use patterns for purposes of ascertaining regional effect showed that the regional effect was strong and that three regions emerged. These regions are New York City, Metropolitan region of New York excluding New York City, and Upstate (the rest of the State). In order to compensate for this regional effect during the derivation process, the choice was made <u>not</u> to build in a region adjustment factor but rather to conduct analysis on regional subsets of the data. For example, when investigating how predictive of resource use ADLs were, each region was analyzed separately.

While this approach of separating regions is acceptable for analysis purposes, the region effect which was demonstrated needs to be an explicit consideration during implementation. Discussion of this aspect of region difference is presented later in this report in the section on casemix index development.

VI.C <u>INFORMAL SUPPORT SYSTEM (ISS)</u>.

The informal support system (ISS) is a significant component in a plan of care for a patient receiving services at home. In the design of the PATH, this was recognized and captured in several different locations including at a task level. The issue of the role of ISS in this research and classification development process focused on three aspects:

- What to measure about ISS?
- How to measure ISS?
- Is it a classification element?

The approach used to address these was both focused discussion in the Workgroup and data analysis.

VI.C.1 <u>Workgroup Discussion</u>.

During the first meeting of the Workgroup, there was extensive discussion within small groups regarding a conceptual approach to classifying the ISS. The role of a classification of the ISS was two fold:

- to classify the ISS for the patients in the sample for use in the development of the patient classification (ISS will be used as a control variable).
- to develop the ISS portion of the assessment instrument.

This discussion resulted in the identification of four dimensions to evaluate an ISS.

- Existence - is there is a viable ISS?
- Duration - how long would the ISS be viable?
- Amount - how much time is available?
- What Services - what services will the ISS provide?

<u>Existence</u>. Existence is not only a measure of whether someone(s) can be identified, but is also concerned with other factors:

- Is the someone(s) availble?
- Is the someone(s) capable?
- Is the someone(s) reliable?

<u>Duration</u>. Duration is concerned with how long can ISS be mobilized? For short periods, such as for terminal care, it is more likely that the ISS can be mobilized, while for long term custodial care it is less likely. If the duration is long, the service system often reponds with higher service amounts to postpone or prevent burnout of the ISS.

Amount. This is a quantitative measure of the number of hours and days the ISS is available on site. The role of the ISS is most critical in those periods where the formal service system is generally unavailable such as evenings, nights and weekends.

What Services. This dimension is measured at the task level of services. The characteristics of the ISS encompassed in this dimension are:

- Willingness. What tasks is the ISS willing to do? In some situations, this willingness is embodied in an attitude of the ISS/family towards a particular care setting. For example, the ISS may have requested institutional placement and this action establishes willingness without considering task level.

- Trainability. Can the ISS be trained in either or both custodial and skilled care tasks?

- Ability. Does the ISS have both the physical and mental capacity to assist the patient in home care? Included as a consideration of physical capacity is the ISS own fraility under a situation where they care for themselves as well as others.

It was the feeling of the Workgroup that capability of the ISS must be assessed against the specific tasks that are needed. The capability of the ISS to perform a task may hinge on the stamina of the ISS considering the other demands on the ISS.

VI.C.2 ISS Data.

There is a high number of persons living alone in the database and there are clear program and regional differences in this number. (See Table VI) The number of persons living alone from New York City is clearly higher than in other regions of the State.

Table VI.1

Pecent Living Alone

Program	NYC	not NYC
Personal Care	68.3	52.4
CHHA	36.2	28.7
LTHHCP	51.1	39.8

In Figures VI.A, VI.B, and VI.C, the level of resource use, aide time and RN time, for the same RUG-II category (Physical A) for different program types is presented for a three level description of the patients living situation and ISS status. These categories are:

- Patients alone with no ISS
- Patiets alone with an ISS
- Patients not living alone.

Figure VI.A

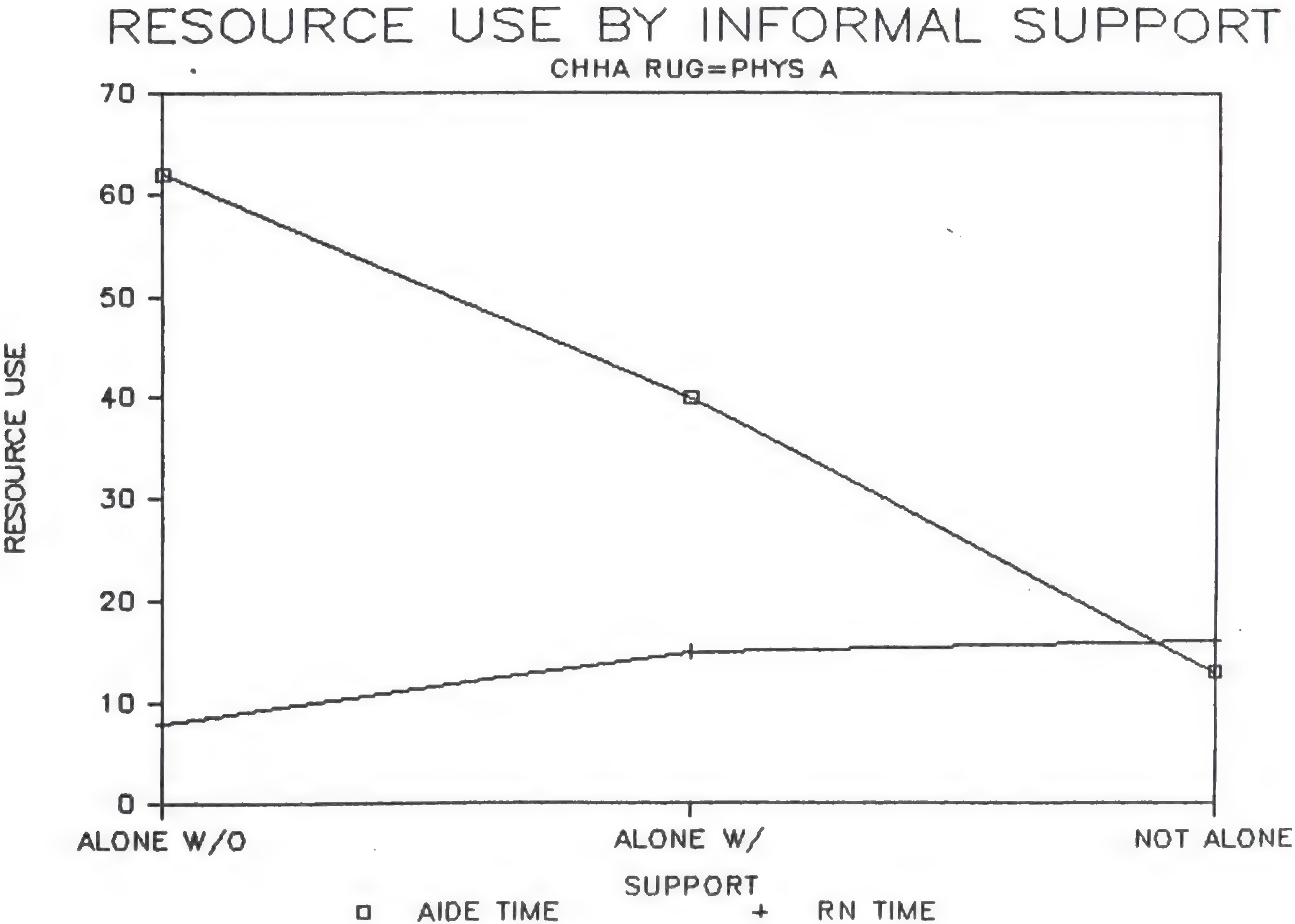

RESOURCE USE BY INFORMAL SUPPORT
CHHA RUG=PHYS A
RESOURCE USE
70
60
50
40
30
20
10
0
ALONE W/O
ALONE W/
NOT ALONE
SUPPORT
AIDE TIME
RN TIME

Figure VI.B

RESOURCE USE BY INFORMAL SUPPORT

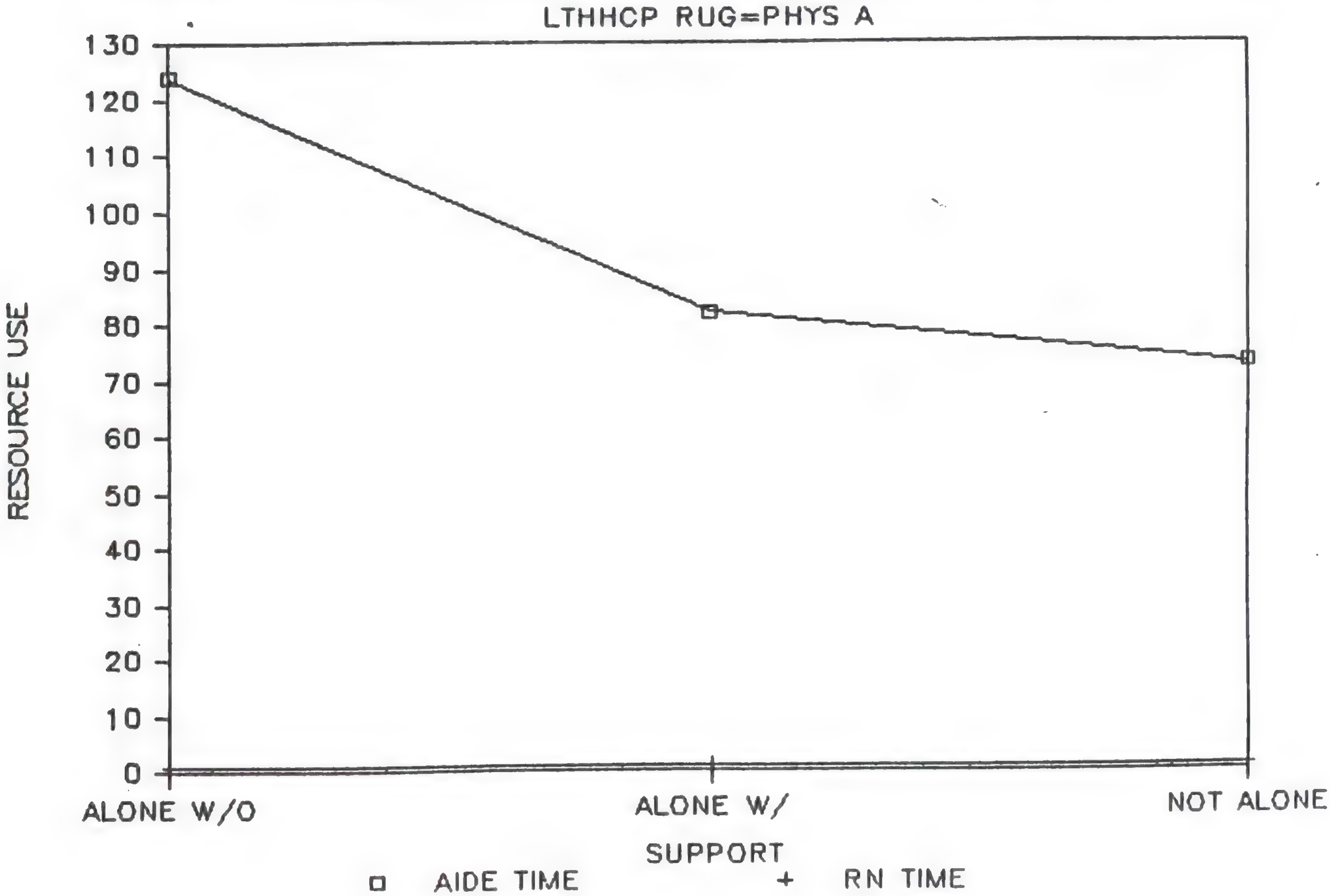
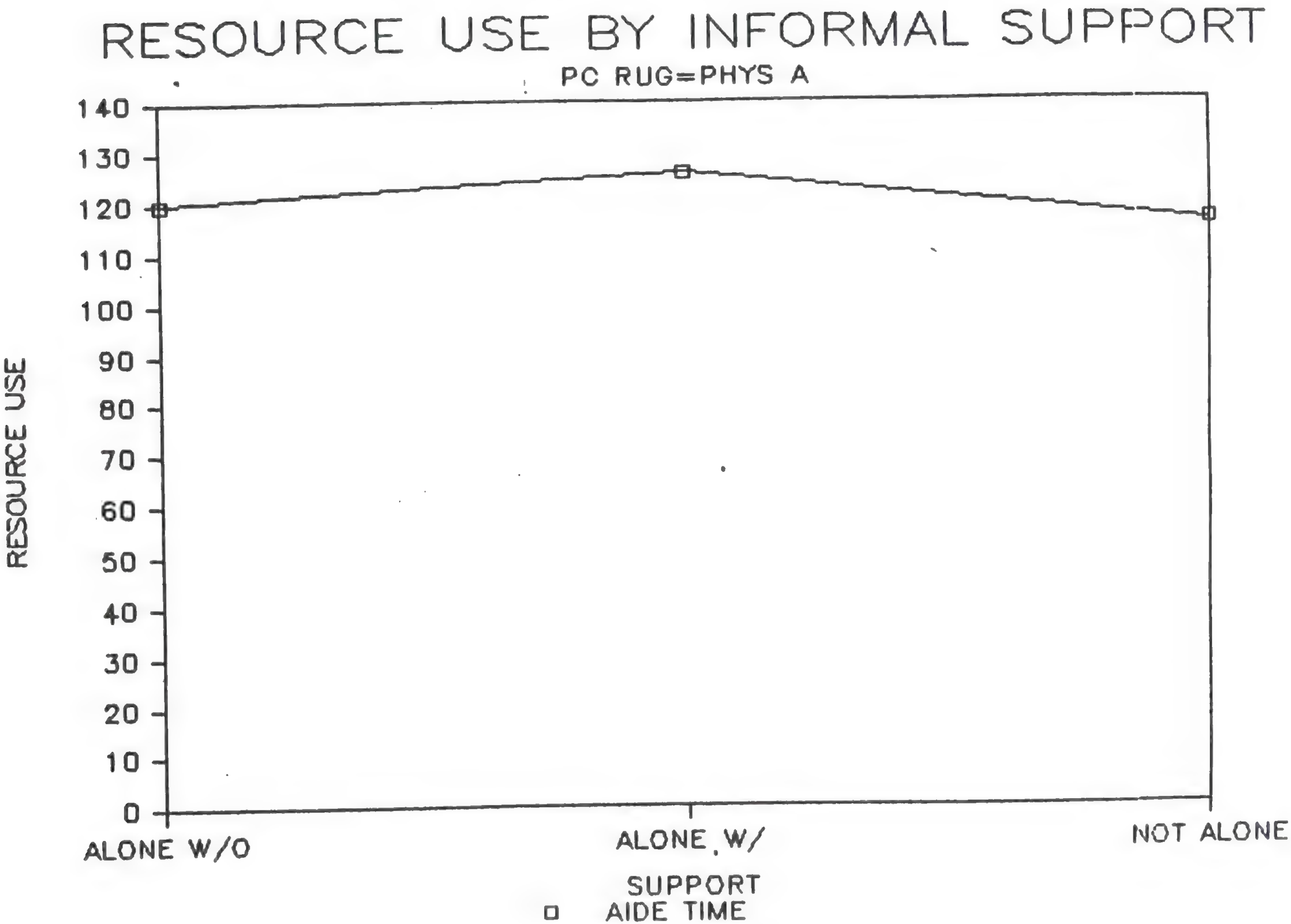


Figure I.C


RESOURCE USE BY INFORMAL SUPPORT
PC RUG=PHYS A
RESOURCE USE
0
10
20
30
40
50
60
70
80
90
100
110
120
130
140
ALONE W/O
ALONE W/
NOT ALONE
SUPPORT
AIDE TIME

These figures show that in two of three programs, resource use decreases as the ISS becomes more accessible. In the third program, PC/Home Attendant, this pattern is not observed. In response to this data, the Workgroup suggested that the ISS is more available and willing when the duration of their involvement is short than for a sustained period. A review of the relationship of duration and the ISS is presented in Table VI.2. The data reveals that while there is some decrease in ISS availability as duration increases, the significant break point is whether the duration is under or over three months. Further, when a regional spilt is done on the PC program, the geographic difference is greater than the duration impact.

Table VI.2

Informal Support Availability
vs. Duration of Illness

ISS availability was measured by the hours IS was said to be available. Duration was measured using duration of diagnosis.

Duration	Mean ISS Availability Statewide	PC Statewide	PC NYC	CHHA Statewide
Less than 3 months	96.24	49.88	46.50	99.95
3 to 6 months	83.40	42.05	25.20	90.74
6 months to 12 months	77.89	54.50	27.53	90.50
1 year to 5 years	69.60	40.94	29.26	107.44
More than 5 years	50.73	35.45	28.25	102.68
No information	51.63	40.96	44.13	74.33

Continued data analysis focused on using characteristics of the ISS as predictors of resource consumption. This results on presented in Table VI.3.

Table VI.3

Percent Variance Reduction for ISS Characterisitics.

	PC NYC	CHHA NYC	Other
Spouse	0%	2.6%	2.0
Child	0	1.6	0
Relative	0	0	0
Sign. Other	0	0	0
Other	4.4	0	0
Presence of ISS	0	2.7	0
Presénce Primary Caregiver	0	0	2.0
ISS Weekday Hrs	0	8.7	6.4
ISS Weekeve Hrs	0	4.2	2.7
ISS Weekngt Hrs	0	2.4	1.6
ISS Weekend Hrs	0	6.6	4.4
ISS Weekend Eve	0	4.4	1.8
ISS Weekend Ngt	0	2.9	1.4

These results lead to two conclusions:

- The ISS is not a major predictor, on the average, of amount of care received by patients in the formal care system.

- The role of ISS is much less in long duration patients than in the shorter stay patients in the CHHAs.

A second analysis examined the reason HC was required to supplement the ISS. The major responses are in Table VI.4.

Table VI.4

Reason Homecare Required

	PC NYC	CHHA NYC	Other
Not Available	214	103	213
Distance to ISS	97	32	86
Resp'bilities Limit ISS	290	130	291
Physical Limitations	57	28	118
Respite	9	11	94
Require Training	1	52	86
Too Demanding Care	31	26	86

The major conclusions from these data are;

- By far, the major reason stated for the need for Home Care was lack of availability of the ISS (none available, distance or other responsibilities).

- Physical limitations and too demanding care are a distant second.

- Requirement for training was a significant response in the NYC CHHA and OTHER population although representing a relatively small percentage.

A review of both data and group findings resulted in defining a role for the ISS in the Patient Classification System.

IV.C.3 Role of the Informal Support System in the Classification System

The ISS has not been found to be a major predictor of resource consumption. This doesn't mean the ISS isn't in many cases providing significant care; it simply means that patients receive highly variable amounts of care. Other analysis has been able to link the amount of care to patient characteristics, regional differences, and program differences in a much stronger fashion than the ISS is linked to amount of care.

The role of the ISS is stronger in the CHHAs. This is probably linked to the duration of the problem. Additional analysis of the relation between duration of the problem and the use of the ISS is needed. In addition, when the classification system is refined, we will rerun AUTOGRP analysis on the patient groups using presence of the ISS as another independent variable to see if additional variance is explained. We might anticipate that the result of that analysis may be recommendations to use two factors regarding the relationship between the case mix measurement system and the amount of care recommended: (1) the presence or absence of an ISS in the home; and (2) the duration the problem has existed. In other words, the system might link the patient class to several levels of resource consumption depending upon the presence and duration factors.

The ISS will not be used in the assessment and classification of the patient. Instead it will be used in a task plan approach similar to the FASTEP. This approach explicity addresses capability and availability on a task specific level. The ISS may be linked to recommended resource consumption levels outside the patient classification itself. To illustrate the concept, note the chart below:

Patient class	No Capable ISS	ISS Available, Duration under 3 months	ISS Available, Duration over 3 months
Physical A	125 Hr/Mo	85 Hr/Mo	105 Hr/Mo
Physical B	160	110 Hr/Mo	140 Hr/Mo

Note: Data in the example are fictitious

These recommendations are reflected in both the patient classification and the patient assessment tool for home care.

VI.D OTHER CLASSIFICATIONS

A search for patient classification systems with application to home care services yielded few returns. The utility of investigating other classifications is that the strengths and weaknesses which are detected can be used in the design of a new classification. Three classification systems were explicitly reviewed and analyzed and a summary of findings is presented below.

VI.D.1 Hardy Home Health Classification.

The Hardy classification (Hardy, 1984) consists of four broad groups of home health patients:

Group 1. acute, non chronic

Group 2. chronic disability with potential for improvement

Group 3. chronic disability with need for ongoing care

Group 4. End stage disease.

This system was coded and applied against the data base. The results are summarized below:

	All Patients			PC NYC		CHHA NYC	
Group	Count	Mean Cost	SD	Count	Mean Cost	Count	Mean Cost
1	752	1150.8	1549.3	18	1325.9	224	1311.8
2	146	1087.7	1923.1	0	0	87	1182.4
3	1327	1088.9	1373.0	662	1051.3	72	1382.2
4	69	1360.7	2649.4	17	1307.6	20	1263.9
Other	15	1730.1	1159.4	3	1452.6	7	1962.2
Total	2309			700		410	
% variance reduction	0.22				0.82		0.46

This classification system has many problems: the patients that do not belong in any of the four groups utilize the most resources; the variance reduction within groups is very low; and the standard deviations of the groups are usually greater than the means. The system is very disease oriented and does not measure the extent to which the disease is affecting the patients functioning.

VI.D.2 Visiting Nurse Association of New Haven, Inc.

This classification is frequently used by home health agencies to characterize their caseload. It consists of five groups and relies heavily on a prognosis judgement. Like the Hardy System, there is no measure of the extent that the disease interferes with functioning.

Group 1. Acute, non-chronic, episodic-type disease or disability; will return to pre-illness level of functioning.

Group 2. Early stage chronic disease or disability who are experiencing an acute episode of illnesses; potential for returning to pre-episodic level of functioning.

Group 3. Intermediate or advanced stage chronic disease or disability who will eventually function without VNA services.

Group 4. Advanced stage chronic disease or disability; maintained at home with on-going VNA service.

Group 5. End stage illness.

The results from applying this against the data base are presented below.

Group	All Count	Mean Cost	SD	PC NYC Count	Mean Cost	CHHA NYC Count	Mean Cost
1	783	1106.9	1501.3	101	1163.8	242	1276.4
2	16	722.9	410.9	1	297.1	4	858.8
3	51	859.9	555.4	0	0	31	855.4
4	1268	1090.1	1410.1	586	1050.5	49	1502.2
5	7	2361.5	1439.7	0	0	7	2361.5
Other	184	1457.6	2336.9	12	1082.3	77	1380.0
Total	2309			700		410	
% variance reduction	0.73			0.50		1.65	

This system also possesses problems similar to the Hardy classification.

VI.D.3 The RUG-II classification system

The RUG-II classification system for nursing home patient, is composed of 16 distinct patient groups which are different in terms of clinical characteristics and statistically different in terms of resource utilization.

The system integrates two basic approaches: (1) the use of a hierarchy of patient types; and (2) secondary subgroups based on ADL function levels using statistical criteria. The five hierarchical groups are:

Special Care
Rehabilitation
Clinically Complex
Severe Behavioral Problems
Reduced Physical Functions

Each of the above clinical groups is further divided by an ADL functioning score, the ADL Index, into subgroups. The ADL Index is composed of three ADL variables: eating, toileting and transfer. The resident is assessed at his/her appropriate level for each ADL; the three individual ADL values are added to form the ADL Index score. The score ranges from a minimum of 3, representing independence or minimal supervision, to 10, representing a patient who requires tube feeding, is incontinent of bowel and bladder and is bedfast.

The specific characteristics of patients in each group are as follows:

- SPECIAL CARE. This group includes very heavy care patients, i.e., their functional level is on the whole very low. Characteristics involved in placing a resident in this group are one or more of the following: coma, quadriplegia, multiple sclerosis, stage 4 decubiti, nasal-gastric feeding, parenteral feeding, suctioning. To qualify, an ADL Index score of 5 or more is also required.

SUBGROUP:	ADL INDEX:
Special A	5-7
Special B	8-10

. REHABILITATION. The rehabilitation group consists of those residents who receive physical or occupational therapy services at least five days a week and have a restorative therapy goal.

SUBGROUP:	ADL INDEX:
Rehabilitation A	3-4
Rehabilitation B	5-10

. CLINICALLY COMPLEX. This group, as contrasted with special care, is distinguished by more acute medical problems or otherwise extensive medical needs. The residents as a group are not so functionally impaired in Activities of Daily Living as the special care group. A clinically complex resident is characterized by one or more of the following: Cerebral palsy, hemiplegia, urinary tract infection, dehydration, internal bleeding, stasis ulcer, late stages of terminal illness, oxygen therapy, wound/lesion care, chemotherapy, transfusions, dialysis, or physician care at least weekly.

SUBGROUP:	ADL INDEX:
Clinically Complex A	3
Clinically Complex B	4-6
Clinically Complex C	9-10
Clinically Complex D	9

. SEVERE BEHAVIORAL PROBLEM. This group is characterized by frequent and severe level of one or more of the following behavioral problems: physical aggression, regression, verbal abuse, or hallucinations.

SUBGROUP:	ADL INDEX:
Behavioral A	3
Behavioral B	4-7
Behavioral C	8-10

. REDUCED PHYSICAL FUNCTIONING. This group includes all residents that do not qualify in the above four hierarchy groups. This group is characterized by reduced levels of Activity Daily Living functioning.

SUBGROUP:	ADL INDEX:
Physical A	3
Physical B	4
Physical C	5-7
Physical D	8
Physical E	9-10

The duration of patients within program type by RUG-II category is presented in Table VI.5. While patients are fairly distributed over RUG-II categories and there are different distribution patterns by program type, two categories, Complex A and Physical A contain a majority of patients. Compared to the other two classification systems tried, RUG-II does substantially better in predicting resource consumption differences. In PC NYC, it explains 33 percent of the variance and in CHHA, NYC, 7 percent. There are several reasons for that.

- RUG-II has sixteen categories, approximately 3 times more than the other systems.
- RUG-II uses clinical definitions of patients in combination with a measure of the illness's impact on the patient's functioning level.

Missing from the RUG-II is consideration of IADL needs and explicit recognition in the classification that certain services and treatments received from the formal service system by the patient must be given by licensed health providers.

TABLE VI.5

RUG-II Categories By Program Type
Percent of Patients in Program

RUG-II Category	Personal Care	Program Certified Home Health	Long Term Home Health
Special A	.48	1.45	1.45
Special B	.68	1.90	1.45
Rehabilitation A	.58	3.69	.73
Rehabilitation B	.19	2.35	.36
Complex A	6.09	25.14	12.73
Complex B	3.00	7.60	5.82
Complex C	.87	3.91	1.45
Complex D	0.00	.34	.36
Behavioral A	.97	.45	1.09
Behavioral B	1.26	.56	1.45
Behavioral C	.19	.34	.36
Physical A	66.63	41.01	48.73
Physical B	5.42	2.23	4.36
Physical C	12.38	7.49	15.27
Physical D	.87	1.34	3.64
Physical E	.39	.22	.73

VI.E ACTIVITIES OF DAILY LIVING (INCLUDING INSTRUMENTAL)

Activities of daily living (ADLs) are an important determinant of resource consumption in the long term care system. This has been demonstrated in journal articles, the home care assessor survey performed by RPI staff, and the findings of the Long Term Care case mix project that developed the RUG-II classification system. In home care, IADLs are also important for clients with little ADL dependence but with extensive IADL need.

VI.E.1 ADLs

Initially to control for regional and program variations, individual ADLs were analyzed for three major groups: Personal Care/Home Attendant Program in New York City (PC NYC); certified home health agencies in New York City (CHHA NYC); and long term home health care programs in New York City (LTHHCP NYC). Summary results are presented in Table VI.6 and details in Table VI.7. The measure of resource use in this analysis was total monthly hours of all formal care providers.

TABLE VI.6
Percent Variance Reduction Using ADLs

	Percent Variance Reduction		
ADLs	PC - NYC	CHHA - NYC	LTHHCP - NYC
eating	15.65	5.20	5.89
mobility	33.22	11.23	6.95
transfer	32.24	6.29	7.69
dressing	35.53	8.47	9.91
hygiene	29.97	7.18	12.84
bathing	32.50	8.20	9.48
toileting	35.39	13.45	15.29

The results show that ADLs are again good predictors of resource consumption differences between patients especially in the Personal Care/Home Attendant Program. In general, the pattern seen is that as the patient becomes more disabled in an ADL, the mean resource use increases.

In previous research, it was found that a combination variable representing a composite score of ADL ability across two or more ADLs was an effective and efficient variable for use in resource consumption. This approach was done by ADL scores (ADLSUM). Each ADLSUM was composed of the summation of the responses of three to five ADL variables. Definitions of the ADLSUMs tried are presented in Table VI.8.

TABLE VI.7
MEAN TOTAL MONTHLY HOURS BY RESPONSE LEVEL FOR ADLS FOR
PCNYC, CHHANYC, AND LTHHCPNYC.

Eating

	PCNYC		CHHANYC		LTHHCPNYC	
Response Level	Count	Mean	Count	Mean	Count	Mean
Independent	300	71.5	559	162.4	92	105.6
Adaptive Equipment	3	41.3	8	265.5	2	194
Intermittent Supervision	56	94.9	82	313.5	23	149.5
Continuous Supervision	10	181.2	18	324.7	9	139.2
Continuous-Human	28	125.3	19	497.7	22	123.7
Hand Fed	14	254.9	19	374.8	7	159.1
Tube/Parenteral	12	51	1	104	1	80
	423		706		156	

PCNYC	CHHANYC		LTHHCPNYC			
Response Level	Count	Mean	Count	Mean	CountMean	
Mobility						
Independent	153	92.6	111	40.3	31	94.9
Adaptive Equipment	229	114.4	118	56.2	44	123.5
Intermittent Supervision	137	232.1	66	107.5	37	112.8
Continuous Supervision	48	370.4	32	107.8	8	135.5
Continuous-Human	60	380.3	35	107.7	8	138.6
Wheeled Independently	33	292.9	15	121.6	2	120.5
Wheeled	19	401.3	20	203.2	5	241.6
Chairfast	10	536.6	18	230.4	8	126.8
Bedfast	13	392.6	9	106.7	3	125.3
	702		424		156	
Transfer						
Independent	388	131.5	192	58.9	79	105.3
Adaptive Equipment	120	133.7	55	70.5	30	120
Intermittent Supervision	71	306.7	75	106.5	18	129.4
Continuous Supervision	17	373.7	24	64	6	148.7
Continuous-Human	77	431.2	45	133	8	205.1
Continuous-Two People	20	403.1	26	196.9	11	131.8
Bedfast	11	389.8	7	85.1	4	119
	704		424		156	
Dressing						
Independent	276	78.1	170	46	38	85.2
Intermittent Supervision	183	193.1	122	85.7	60	121.2
Continuous Supervision	70	261.8	16	114.5	13	127
Continuous Human Assistance	117	363.1	68	114.9	24	133.3
Total Assistance	41	416.2	31	202	17	169.7
Bed Gown	16	382.4	15	124	3	129.3
	703		432		155	
Hygiene						
Independent	314	97.9	163	44.7	51	85
Intermittent Supervision	189	206	136	84.9	56	133.6
Continuous Supervision	39	276	18	117.3	6	104.8
Continuous Human Assistance	103	362.4	63	150.6	24	131.2
Total Assistance	60	388	42	141.1	18	168.4
	705		422		155	
Bathing						
Independent	111	45.6	105	37.2	10	57.9
Adaptive Equipment	76	92.8	23	64.2	9	95.9
Minimal Supervision	254	159.8	152	75.5	64	114.6
Continuous Supervision	58	232.1	17	96.4	9	103.2
Continuous Human Assistance	133	339.3	82	112.4	41	128.9
Total Assistance	75	399.4	45	193	22	161.8
	707		424		155	

	PCNYC		CHHANYC		LTHHCPNYC	
Response Level	Count	Mean	Count	Mean	Count	Mean
Toileting						
Independent	303	114.9	212	45.6	76	95.9
Adaptive Equipment	114	162.6	49	115	34	121.8
Intermittent Supervision	83.9	283.9	63	103.9	13	178.2
Continuous Supervision	12	447	2	40	1	168
Continuous Human Assistance	71	404.3	50	103.4	12	127.3
Total Assistance	24	407.5	12	292.7	5	148.2
Incontinent	32	412.8	32	138.5	12	184.2
Toileted	11	418.2	4	344	3	107
	707		424		156	

TABLE VI.8
Definitions of ADLSUMs

ADLSUM	Definition
ADLSUM 1	Eating + Toileting + Transfer
ADLSUM 2	Eating + Toileting + Mobility
ADLSUM 3	Eating + Toileting + Mobility + Dressing + Bathing
ADLSUM 4	Eating + Toileting + Transfer + Dressing + Bathing
ADLSUM 5	Eating + Toileting + Mobility + Dressing
ADLSUM 6	Eating + Toileting + Mobility + Bathing
ADLSUM 7	Eating + Toileting + Transfer + Dressing
ADLSUM 8	Eating + Toileting + Transfer + Bathing

As a control for casemix differences for testing two ADL composite measure, the RUG II hierarchy was used. The results of these tests using variance explanation as the measure are presented in Tables VI.9 and VI.10.

TABLE VI.9

Percent Variance Reduction for ADLSUM 1.
Percent Variance Reduction within RUG II Hierarchy Groups

RUG Hierarchy	All	PCNYC	CHHA NYC
	11.16	0	0
Special	14.3	0	33.3
Rehab	2.4	38.8	18.9
Complex	13.5	0	0
Behavior	11.3	36.5	9.8
Physical			

Table VI.10

Percent Variance Reduction for ADLSUM 2
RUG-II Hierarchy Groups

RUG Hierarchy	All	PCNYC	CHHA NYC
	22.76	0	0
Special	26.0	0	36.6
Rehab	3.9	32.7	23.2
Complex	13.3	0	0
Behavior	12.3	39.9	13.6
Physical			

For the remaining ADLSUMs, the entire database was used for the test. These results are presented in Table VI.11.

Table VI.11

Percent Variance Reduction of ADLSUMs

ADLSUM	% Variance Reduction
ADLSUM 1	13.9
ADLSUM 2	15.8
ADLSUM 3	17.3
ADLSUM 4	17.3
ADLSUM 5	16.9
ADLSUM 6	17.3
ADLSUM 7	16.3
ADLSUM 8	16.6

Patterns that emerged from this analysis were:

- For ADLSUM 1 and ADLSUM 2 which use only three ADLs, ADLSUM 2 which uses MOBILITY in place of TRANSFER achieves better variance explanation.
- In the four and five component ADLSUMs, the ones which use BATHING achieve better variance explanation.
- The advantage that substituting MOBILITY for TRANSFER as one of the ADLs had in variance explanation is very much reduced when a fourth and fifth ADL are added to the score.

The following sets of questions were prompted by the analysis:

- Should TRANSFER or MOBILITY be used?
- How many ADLs should be used in creating the score?
- Which ADLs should be used in the score?
- Can a collapsed scale be used instead of the full set of descriptors on the PATH?

MOBILITY VS. TRANSFER. The decision was to use TRANSFER in the ADL index. The reasons for this choice included:

1. With the addition of either DRESSING or BATHING to the ADL index, the explanatory power of MOBILITY and TRANSFER were similar.

2. TRANSFER was used in the RUG II ADL Index. One criterion was to parallel the RUG-II system where appropriate.

3. The responses to MOBILITY were not ordinal with respect to resource use. The 'Wheeled Independently' response followed the 'Continuous Human Assistance' response in number sequence yet the resource use was lower. Given the correlation that existed between the different ADLs as a predictor of resource consumption, defining a rescaling of the responses to gain such ordinality would be technically difficult.

How many ADLs? The percent gain in variance explanation moving from a three component ADL index to a four component averaged 1.9 percent. The gain between a four and five component ADL index averaged .5 percent. There clearly was a decreasing marginal gain. Further, many patients in home care were relatively ADL independent. By adding more ADLs to the scale, a finer measure of the less populous high ADL dependent patient was being developed; there was no gain in explaining resource differences between patients who are independent by adding more ADLs to show they are also independent in those. Use of IADLs on the most populous should lead to a better definition of ability and resource usage. The decision was to use a four component ADL scale.

Which ADLs? The ADLs EATING, TOILETING, and TRANSFER are used in RUG-II and analysis showed that they were effective in home care as well. The choice of the fourth ADL to incorporate into the scale narrowed to a choice between BATHING and DRESSING. The decision was to use BATHING as the fourth ADL. The reasons for this choice included:

1. The four ADL component scores with BATHING showed greater variance explanation than the scores using DRESSING.

2. Discussion within the workgroup raised BATHING as an ADL that is very often a need which is addressed because of the fear of patient and family of accidents while BATHING.

3. For patients independent in TOILETING, EATING and TRANSFER, there was a much broader representation of dependency level in BATHING than in DRESSING. This broadness will lead to a more descriptively refined classification system.

Collapsed Scale. In previous research on the RUG-II classification, a collapsed ADL index scale was used. This collapsing was done at the level of the original descriptive responses to the ADL questions. The collapsed scale proved as effective in predicting resource consumption patterns in nursing homes as the uncollapsed scale. The reasons for collapsing the scale include:

1. The value range for the ADL index is less than 4 through 28 of an uncollapsed index. Because the range is smaller, it is easier to understand intuitively.

2. A given response is broader and the fine distinctions which often are the cause of disagreement among assesors do not have to be considered.

3. A collapsed scale is less subject to gaming by assessors.

Collapsing should be avoided if the collapsed index is not as effective as an uncollapsed one. The collapsed scale for ADLs developed for this classification ranges from 4 which indicates independence in all four ADLs to 19 which indicates the highest dependency level in all four ADLs. The values which responses on the PATH take in this collapsed scale are presented in Table VI.12.

Table VI.12
Collapsed Values for ADLS

ADL	Response	Collapsed Value
EATING	1. Indepedent	1
	2. Adaptive Equipment	1
	3. Intermittent Supervision/ Assistance	2
	4. Continuous Supervision	3
	5. Continuous Human Assistance	3
	6. Totally Fed by Hand	4
	7. Tube or Parenteral Feeding	5
TRANSFER	1. Independent	1
	2. Independent with Equipment	1
	3. Intermittent Supervision/ Assistance	2
	4. Continuous Supervision	3
	5. Continuous Human Assistance	3
	6. Continuous Assistance of Two Persons	4
	7. Bedfast	5
TOILETING	1. Independent	1
	2. Independent	1
	3. Intermittent Supervision/ Assistance	2
	4. Continuous Supervision	3
	5. Continuous Human Assistance	3
	6. Total Assistance	4
	7. Incontinent, Does not use toilet	4
	8. Incontinent, toileted	5
BATHING	1. Independent	1
	2. Independent with Equipment	2
	3. Minimal Supervision/ Assitance	3
	4. Continuous Supervision	4
	5. Continuous Human Assistance	4
	6. Total Assistance	4

VIE.2. Instrumental Activities of Daily Living

Instrumental Activities of Daily Living (IADL'S) were analyzed in the same manner that ADLs were. The role that IADLs was to play in the classification was that of the last partitioning variable to establish the terminal groups. It was thought that as a partitioning variable, they would be more predictive of resource consumption differences among the ADL independent group because of correlation between ADL and IADL ability of patient.

In Tables VI.13 and VI.14 the percent variance explained by each of the IADL questions and responses is presented. The results show that IADLs are good predictors of resource consumption differences between patients, especially persons in the Personal Care/Home Attendant Program. In general, a pattern of increased resource use as IADL dependence increases is observed.

Table VI.13
Percent Variance Reduction using IADLs

IADL	PC-NYC	CHHA-NYC	LTHHCP-NYC
answer phone	21.35	2.09	3.95
call phone	21.73	3.19	4.84
public transport	12.45	3.15	5.17
private transport	22.45	6.56	4.31
light meal	26.99	4.76	9.63
cooked meal	13.76	3.49	6.85
light work	12.07	2.78	7.03
heavy work	0	1.57	1.06
laundry	0	2.16	1.46
shopping	2.34	2.12	2.93
appointment	21.08	2.75	2.76

Table VI.14
Mean Total Monthly Hours by Response Level
for IADLs for PCNYC, CHHANYC, and LTHHCPNYC.

Telephone Use: Answers calls

Response Level	PCNYC Count	PCNYC Mean	CHHANYC Count	CHHANYC Mean	LTHHCPNYC Count	LTHHCPNYC Mean
Not Applicable	39	252.9	39	72.4	7	136
Independent	532	149.5	294	76.2	107	110.5
Intermittent Assistance	36	357.7	22	81.6	6	149.3
Continuous Supervision	2	420	2	8	1	33
Continuous Assistance	12	393.3	16	158.8	3	127.3
Totally Dependent	85	309.7	61	124.3	32	144.5
	706		424		156	

Telephone Use: Places Calls

Response Level	PCNYC Count	PCNYC Mean	CHHANYC Count	CHHANYC Mean	LTHHCPNYC Count	LTHHCPNYC Mean
Not Applicable	36	260	38	67.6	4	133
Independent	495	141.3	261	77.4	90	105.5
Intermittent Assistance	50	302.6	26	38.3	19	140.8
Continuous Supervision	5	412	2	8	0	0
Continuous Assistance	26	380.6	11	66.2	4	124.3
Totally Dependent	94	368	86	138.4	39	141.3
	706		424		156	

Transportation: Public

Response Level	PCNYC Count	PCNYC Mean	CHHANYC Count	CHHANYC Mean	LTHHCPNYC Count	LTHHCPNYC Mean
Not Applicable	256	232.1	154	81.5	72	111.3
Independent	78	50.1	59	34.9	10	70.5
Intermittent Assistance	127	115.9	51	60.2	8	210.5
Continuous Supervision	16	198.3	14	73.4	1	108
Continuous Assistance	72	252.7	24	113.2	6	126
Totally Dependent	154	267.9	119	125	59	126.1
	703		421		156	

Transportation: Private

Response Level	PCNYC Count	PCNYC Mean	CHHANYC Count	CHHANYC Mean	LTHHCPNYC Count	LTHHCPNYC Mean
Not Applicable	19	351.8	53	46.2	13	112.4
Independent	116	57.9	83	38.5	14	77.6
Intermittent Assistance	218	136.6	74	64.2	30	125.7
Continuous Supervision	49	224.5	18	60.4	4	135.3
Continuous Assistance	154	254.4	73	129.5	45	113.3
Totally Dependent	148	320.2	115	115	50	135
	704		416		256	

Meal Preparation: Light

Response Level	PCNYC Count	PCNYC Mean	CHHANYC Count	CHHANYC Mean	LTHHCPNYC Count	LTHHCPNYC Mean
Not Applicable	6	202	18	75.8	3	70.7
Independent	272	76.1	130	43.8	51	93.7
Intermittent Assistance	40	140.4	44	60.5	28	122
Continuous Supervision	5	196	6	160	4	233.3
Continuous Assistance	27	221.7	17	88.9	20	111.7
Totally Dependent	364	290.1	207	116.7	50	142.7
	704		422		156	

Meal Preparation: Heavy

Response Level	PCNYC Count	PCNYC Mean	CHHANYC Count	CHHANYC Mean	LTHHCPNYC Count	LTHHCPNYC Mean
Not Applicable	5	96.4	21	77.9	1	80
Independent	93	42.7	59	30.4	13	93.9
Intermittent Assistance	49	79.3	50	36.2	27	93.3
Continuous Supervision	6	147.3	5	112.8	2	422
Continuous Assistance	36	161.3	29	75.4	27	102.9
Totally Dependent	515	244.3	259	109.3	85	130.9
	704		423		155	

Housework: Light

Response Level	PCNYC Count	PCNYC Mean	CHHANYC Count	CHHANYC Mean	LTHHCPNYC Count	LTHHCPNYC Mean
Not Applicable	2	56	22	80	1	100
Independent	166	80.7	83	46.6	16	67.1
Intermittent Assistance	16	121	34	48.9	19	105.5
Continuous Supervision	1	196	3	42.7	3	275.3
Continuous Assistance	15	156	16	70.3	25	115.8
Totally Dependent	504	242.1	266	104.8	92	128.4
	704		424		156	

Housework: Heavy

Response Level	PCNYC Count	PCNYC Mean	CHHANYC Count	CHHANYC Mean	LTHHCPNYC Count	LTHHCPNYC Mean
Not Applicable	28	185.9	29	65.2	0	0
Independent	1	16	17	30.6	0	0
Intermittent Assistance	9	106.2	20	34	1	48
Continuous Supervision	1	195	3	33.3	1	672
Continuous Assistance	10	156.8	17	61.2	15	99.8
Totally Dependent	652	201.9	337	95.4	139	118.7
	701		424		156	

Housework: Laundry

Response Level	PCNYC Count	PCNYC Mean	CHHANYC Count	CHHANYC Mean	LTHHCPNYC Count	LTHHCPNYC Mean
Not Applicable	2	118	24	75.7	0	0
Independent	4	52	26	31.1	1	80
Intermittent Assistance	10	100.4	23	25.4	9	102.2
Continuous Supervision	1	196	1	8	1	672
Continuous Assistance	11	142.2	20	58.8	15	97.7
Totally Dependent	676	202.7	330	97	129	119.5

Shopping

Response Level	PCNYC Count	PCNYC Mean	CHHANYC Count	CHHANYC Mean	LTHHCPNYC Count	LTHHCPNYC Mean
Not Applicable	0	0	16	80.5	0	0
Independent	1	196	32	36.3	4	85.5
Intermittent Assistance	25	110.7	30	39.7	8	105.3
Continuous Supervision	3	214.7	2	6	1	672
Continuous Assistance	33	88.7	26	62.3	30	98.2
Totally Dependent	644	208.8	318	67.9	113	123.1
	706		424		156	

Appointments

Response Level	PCNYC Count	PCNYC Mean	CHHANYC Count	CHHANYC Mean	LTHHCPNYC Count	LTHHCPNYC Mean
Not Applicable	2	672	13	73.2	1	80
Independent	311	107.5	150	53.2	36	96.6
Intermittent Assistance	120	198.6	52	85.2	37	19.4
Continuous Supervision	9	177.8	5	145.6	3	121.3
Continuous Assistance	36	248.6	44	141.6	32	121.1
Totally Dependent	227	316.2	159	100.8	47	137.4
	705		423		156	

The tables also show that for many IADLs, most patients are totally dependent in the IADL. This is in contrast to the pattern seen with ADLs of general independence. Combining these two observations describe a patient type who is generally independent in ADLs but highly dependent in IADLs.

The analysis approach started with several premises some of which were based on experience with ADLs.

. There is high correlation between IADLs

. A score of IADL ability most likely could be developed to summarize IADL ability.

. A collapsed scale for IADLs should be tried.

. The frequency of need for an IADL activity is very activity dependent and this need frequency combined with an ability measure for the IADL should predict resource use.

To explore the last premise, the IADLs were divided into four classes: daily activities, weekly activities, monthly activities, and 'as needed' activites. For each class of IADL a score was computed by summing the responses for the IADLs in that class.

Class	IADLs	Range of Score	Explanation of Range
Daily	Light meal preparation Prepares, cooks dinner	2-12	2 = Not applicable 4 = Independent in both 12 = Totally dep in both
Weekly	Light Housework Heavy Housework Lounders clothes Shopping Transportation, Public Transportation, Private	6-36	6 = Not applicable 12 = Independent in all 36 = Totally dep in all
Monthly	Money Management Appointments Heating	3-18	3 = Not applicable 6 = Indepent in all 18 = Totally dep in all
As Needed	Answer calls places calls	2-12	2 = Not applicable 4 = Independent in both 12 = Totally dep in both

A summary of results for this analysis is presented in Table VI.15. The results show that while there are a number of patients highly dependent in Daily and Weekly IADLs, there are patients entirely independent in IADLs.

Table VI.15
IADL Score Distribution.

Daily IADL's Score Range	Percent of Patients
2 - 6	28.3
7 - 12	71.7

Weekly IADL's Score Range	Percent of Patients
6 - 12	5.1
13 - 18	4.8
19 - 24	24.6
25 - 30	42.6
31 - 36	32.8

Monthly IADL's Score Range	Percent of Patients
3 - 6	19.5
7 - 12	42.7
13 - 18	37.8

As Needed IADL's Score Range	Percent of Patients
2 - 6	76.6
7 - 12	23.4

A correlation analysis shows high correlation between the IADLs. This indicated that measuring one IADL will imply the performance of other IADLs. High correlations exist between: answering and placing calls, money management and phone use, and light housework and laundry. These results are very supportive of using a composite score of IADL ability.

Other analysis showed that there is hierarchy of loss of outside/inside activities. The degree of assistance with IADLs was not, in general, an indicator of resource utilization. The judgement that the client is not independent in that activity was the major factor in a resource response. Because of these observations, it was felt that a scale of IADL ability could be effective in a classification system. The decisions here were the same as in development of the ADL scale; which variable, how many, and can they be collapsed.

The choice of which variables to include in a scale measurement of IADL was made by considering the following:

1. Which IADL characteristics are ones which all persons require and are not dependent on other factors affecting the patients need for an IADL? For example, use of transportation is dependent on whether the client has to go anywhere as much as it is dependent on whether they can use it.

2. IADLs which are performed more often are more likely to better predict resource consumption differences because of frequent need to perform activity.

3. The Workgroup raised in discussion a dichotomy of IADLs; these inside the home and those outside. The group felt that each side of the dichotomy should be present in the classification.

Consideration of which variables to include also results in a decision of how many.

The classification system's IADL score consists of summing the scale collapsed responses for SHOPPING, COOKING MEALS, and LIGHT MEAL PREPARATION. Both inside and outside of house IADLs are included. The score ranges from 3 to 9 with 3 representing independence in all three IADLs.

Collapsed Values for IADLs

IADL	Response	Collapsed Value
SHOPPING	1. Not Applicable	1
COOKING MEALS	2. Independent	1
LIGHT MEAL/	3. Intermittent Supervision/Assistance	2
PREPARATION	4. Continuous Supervision	3
	5. Continuous Human Assistance	3
	6. Totally Dependent	3

VI.E.3 Defining a Clinical Partition.

The success of ADLs and IADLs as predictors of resource consumption could be used as a starting point for a classification. If the analytic approach was to be strictly statistical partitioning, then these characteristics clearly would be used as the first partition. However, use of these characteristics would not result in a classification which would serve the goal of this research; to develop clusters of patients which could serve as a basis for realigning the role of home care providers. To achieve this end, the classification must be good at distinguishing the amount of resources used and the type (skill level of caregivers).

In previous classification research, the hierarchy approach to partitioning proved fruitful. Further, the Workgroup was supportive of a hierarchy partitioning approach and on many occasions presented ideas and experiences of the types of patients which are present in home care.

Several factors pointed to the RUG-II system as a starting point for the development of a clinical hierarchy for a classification.

1. Patients receiving home attendant/personal care services typically receive such service over an extended time period parallelling the long stay characteristic of many nursing home patients.

2. One of the major home care programs, the Long Term Home Health Care Program, is specifically designed to serve as an alternative to nursing home placement.

3. The home care benefit of Medicare is an extended care benefit much in the same manner as the SNF Medicare benefit.

The development process for a home care hierarchy began with consideration of the RUG-II system.

Development of a clinical partition is a challenge to both data analysis and clinical judgement. Because of this, the process is iterative involving a loop between clinical judgement to data findings to clinical judgement and so on. A key actor in this process was the Workgroup. Early contact with the group involved explaining the meaning and intent of a classification system and emphasizing that classification is a way to describe and discriminate between the major types of patients receiving home care. This theme also was repeated at all subsequent meetings.

Initial work with the group involved two approaches to a clinical partition. The first was to open the floor in a small group process to define the major types of home care patients. In many cases, these definitions involved the goal of care or prognosis for the patient. The second approach was to take the RUG-II system, present results on the distribution of patients by provider type within the system, and to review at the hierarchy condition level the applicability of the condition to home care patients. The purpose of this second approach was to determine:

1. Conditions in the RUG-II system which are not appropriate for home care.

2. Whether the definition of the RUG-II condition was appropriate and what change was needed to make it appropriate.

3. Conditions not in the RUG-II system which should be added to the RUG-II hierarchy to make it appropriate for home care.

4. Whether other hierarchy groups should be defined.

The Workgroup made the following suggestions and observations:

1. PT/OT/ST delivered 2-3 times per week to a patient indicates the patient is undergoing restorative rehabilitation.

2. The RUG-II special hierarchy should also include parenteral, antibiotic or intravenous therapy and ventilator use.

3. The RUG-II complex hierarchy should also include:

   - Foley catheter care patients.
   - Patients receiving medication teaching, evaluation and observation.
   - Patients on drugs which require skilled observation of effects such as blood thinners and diuretics.
   - Insulin dependent diabetics with retinopathy
   - Patients with recent onset of a diagnosis or a recent acute episode and now medically unstable.
   - COPD requiring nightime oxygen.

4. The RUG-II Behavioral Hierarchy should be expanded to include patients with dementia, schizophrenic patients, and patients who have unpredictable mental conditions or who are noncompliant.

5. The RUG-II Physical Hierarchy should be defined to be patients with general deteriorating conditions.

6. A new hierarchy representing patients with IADL needs requiring environmental maintenance assistance should be considered.

7. In some form, either at this level or at sub-levels, the mental status of the patient needs to be considered. For patients with mental problems such as forgetfulness the response of the service provider system is very resource intense.

8. While there are substantial numbers of patients with medical problems, a large number of patients do not have such problems but have problems associated with being alone and unable to manage. This group is best called the 'frail elderly'.

In the course of discussion on classifying patients, the Workgroup suggested that services are also driven by the following considerations.

1. Informal support availability, ability and willingness.

2. Environment and surroundings.

3. Compliance of the patient with care plan. If the patient is compliant, he will receive less service.

4. Accessibility to service either in the geographic area or even within the providing agency.

5. Locus of assessment will determine perception of the assessor and impact or services recommended.

6. Funding source for services, e.g. Medicaid, Medicare, or private.

While each of these is recognized as a factor in determining service amount, many cannot be considered within the context of a patient classification system. Further, the design of the research was purposeful in that services being measured are those being given and not the abstract of what is needed.

Building on the Workgroup observations and analysis of the database, four diferent hierarchies were developed. These hierarchies are presented in the chronological order that they were proposed. Features of the early hierarchies are clearly present in the latter and the four might be described as evolutionary versions of the first.

VI.E.3a. Hierarchy I

Hierarchy I is a nine category patient classification for skilled care patients. The classification relies heavily on patient diagnosis and medical conditions. It is not prognosis oriented in contrast to the classification systems reviewed previously in this report for skilled care patients. Two groups are defined by the services which are given the patient; the RN Restorative and the Post Surgical groups.

This classification is presented in Table VI 16. Under each group, the conditions which place a patient in that group are listed. For each condition, resource use data is presented along with the number of patients with the condition. The data is presented so that all patients with a condition are included. If they have multiple conditions, the patient is counted in all conditions.

While the classification forms homogenous groups with respect to 'body system' or condition (example, fractures) being treated, the data shows that there are very different resource amounts and types among the conditions within the same classification group. The way in which the classification is defined, that is listing a number of conditions, reveals several interesting things about the home care populations.

- For many conditions, the frequency of occurrence is very low and this is an impediment from a design perspective to including them as conditions in a classification system.

- For some conditions, there are substantial occurrences as well as a resource use pattern (such as total cost or mix of skills of caregivers) which indicate that the condition might be one upon which a classification system can be built.

One question which this classification raised was the meaning of a restorative home care patient. This question was posed to the Workgroup.

Table VI. 16

HIERARCHY I
Nine Category Patient Classification For Skilled Care Patients

Average Group/Condition	Number of Patients	Average Total Hours	Average PT&OT+ST Hours	Average RN Hours	Total Cost
RN Restorative					
1. Range of Motion	454	121.05	5.95	5.42	1452
2. Nursing Teaching	408	90.46	1.16	7.49	1001
3. Equipment Teaching	47	75.19	2.04	5.83	943
Terminal Illness	147	82.05	1.58	8.50	1133
Fractures					
1. Ankle	4	29.00	2.00	2.00	410
2. Carpal Bone	1	4.00	8.00	4.00	663
3. Humerus	2	22.00	8.00	6.00	907
4. Head of Femur	11	60.91	4.36	4.91	877
5., Neck of Femer	23	93.65	8.52	5.48	1469
6. Unspecified Femur	6	78.00	5.33	6.00	1145
7. Pelvis	8	173.13	2.50	0.13	1254
8. Ribs, Sternum, Larynx	4	18.50	3.00	11.50	835
9. Tibia/Fibula	7	116.29	2.86	2.00	1010
10. Vertebral Column	8	91.13	1.00	1.63	709
11. Limbs, Unspecified	80	103.09	2.25	4.49	1043
Cardiovascular					
1. Acute Myocardial Infarct	29	77.48	2.76	6.45	962
2. Angina Pectoris	54	92.31	1.31	3.04	817
3. Dysrhythmias	29	100.66	0.86	4.66	948
4. Cardiac Arrest	6	52.17	1.50	6.83	843
5. Chronic Ischemic Heart Disorder	12	82.42	2.33	2.75	79
6. Congestive Heart Failure	137	90.93	1.50	4.88	900
7. CHF with EDEMA	11	58.55	1.91	3.64	724
8. Mitral Valve Disease	4	130.00	0	3.00	788
9. Myocarditis, Nos	18	137.39	1.11	1.61	1041
Respiratory					
1. Pulmonary Edema	6	35.33	2.00	8.00	795
2. Asthma	33	82.42	1.45	1.70	695
3. Bronchitis, Nos	3	74.67	1.33	1.33	599
4. Pneumonia	24	73.50	3.33	6.42	995
Diabetic	73	103.84	2.11	5.66	1049
Other Orthropedic					
1. Amputation Stump Computation	3	233.33	6.67	9.33	2254
2. Osteoarthritis	30	127.50	1.20	1.23	926
3. Traumatic Amputation Leg	10	131.80	4.80	1.70	1165
Neurological					
1. Cerebral Infaction	7	115.57	1.71	1.57	889
2. Cerebral Palsy	8	119.50	4.50	0	1006
3. Cerebral Thrombosis	1	48.00	8.00	0	902
4. CVA, Acute	45	120.89	10.58	5.69	1703
5. CVA, Late Effects	108	142.56	3.74	2.19	1232
6. Convulsions	19	103.68	6.16	3.05	1222
7. Hemiplegia	4	138.50	9.00	2.50	1535
8. Huntington's Chorea	--	------	----	----	----
9. Intercerebral Hemorrhage	12	64.75	6.67	4.42	1043
10. Multiple Sclerosis	25	171.68	1.52	2.56	1478
11. Parkinson's	15	169.60	3.47	3.80	1438
12. Quadriplegia	3	289.67	5.33	1.67	2539
13. Transient Cerebral Ischemia	13	87.77	0.62	2.54	707
Post Surgical					
1. Wound Care	234	76.12	2.90	12.00	1273
2. Hospital Surgery	208	62.80	4.43	6.63	1018

Note: All resource use measures are reported for a 28 day 'month'.

VI.E.3b Hierarchy II

This hierarchy was developed by members of the Workgroup and presented at a meeting in early June for discussion purposes and was applied to the database for presentation at the June 19 Workgroup meeting. The design philosophy behind this classification was hierarchial with the highest resource use group first and the least resource consuming group last as a residual or catch all group. The hierarchy closely paralleled the RUG-II classification and has 6 principal groups. This classification is presented in Table VI.17 and as in the previous table, resource use by condition is presented.

The classification is a mixture of use of conditions and treatments to define the hierarchy categories. While it achieves somewhat better resource use homogeneity than Hierarchy I, there are several places where homogeneity is not achieved.

1. The Exceptional Care category is a mixture of patients with respect to resource use and the category average resource use is less than the succeeding group in the hierarchy.

2. The Behavioral category is defined by presence of a condition and from a resource use perspective represents a diverse use of resource skill level. Some conditions receive extensive RN services while others receive none.

3. The Restorative Rehab group is defined by the receipt of PT, OT and ST services. For areas where these personnel are in short supply and where RN's administer Rehab care, a patient receiving Rehab administered by a RN would be excluded from this category.

The issues which were raised in reaction to this hierarchy included:

1. What is a Restorative Rehab patient?

2. How different are the Exceptional Care Patients in this hierarchy from other skilled care home care patients?

3. The classification is oriented to the home care patient receiving skilled services and does little to characterize the home care patient receiving high levels of predominately aide services.

To address the issues and to overcome some of the resource use homogeneity problems prevalent in this classification, a third hierarchy was proposed by research staff to the Workgroup.

Table VI. 17

Hierarchy II
Clinical Workgroup Hierarchy

Group/Condition	Number of Patients	Total Hours	PT+OT+ST Hours	RN Hours	Total Cost
Exceptional					
1. Aids	8	82.50	1.00	9.50	1239
2. Parenteral Nutrition	9	145.78	4.00	2.22	1244
3. Chemotherapy	9	102.22	0.44	7.56	1171
4. IV Therapy	8	22.00	1.50	12.00	815
5. Dialysis	16	158.00	2.75	8.50	1580
6. Ventilator	8	97.88	2.00	3.88	921
Restorative Rehab					
1. Restorative Goal	93	61.33	5.42	6.06	1056
2. Services>2Times per Wk	247	89.47	13.14	7.32	1757
Special					
1. Comatose	11	88.27	1.09	5.36	990
2. Enternal Feed	1	4.00	0	4.00	210
3. N/G Tube	6	31.33	4.00	18.00	1254
4. Quadriplegia	6	151.17	16.00	1.17	1956
5. Stage 3-4 Debubitus	86	132.34	3.19	9.50	1523
6. Complex Wound Care	173	58.57	2.71	12.68	1185
7. Suctioning	11	142.18	3.27	4.73	1350
8. Trach Care	1	32.00	0	0	299
9. Catheter Care	34	152.97	3.65	4.26	1532
10. Multiple Sclerosis	12	244.58	2.50	0.58	1868
11. Injection	8	16.50	2.00	9.00	636

Group/Condition	Number Patients	Total Hours	PT+OT+ST Hours	RN Hours	Total Cost
Clinical Complex					
1. Oxygen Therapy	26	131.15	0.62	2.54	1054
2. Inhalation Therapy	0	0	0	0	0
3. Stasis Ulcer	84	87.80	2.98	9.51	1218
4. Dehydration	34	60.03	2.76	8.68	983
5. Terminal Illness	147	82.05	1.58	8.50	1133
6. Cerebral Palsy	5	196.60	0	1.40	1281
7. Catheter Insertion	55	132.51	4.18	10.76	1698
8. Respiratory Care	27	92.37	3.11	4.67	994
9. Ostomy Care	22	45.00	1.64	11.00	912
10. Medication>3times a day	0	0	0	0	0
11. Insulin Therapy	58	113.00	0.14	4.31	929
12. Bowel/Bladder Training	43	118.95	4.28	5.00	1340
13. COPD	39	78.64	1.85	2.23	730
Behavioral					
1. Alzhimer's Disease	11	131.73	0.36	1.91	971
2. Depression	64	82.47	3.78	6.50	1116
3. Schizophrenia	4	83.00	0	0	513
4. Dementia	14	204.93	0	0.64	1305
5. Wandering	81	130.21	2.07	4.48	1172
Reduced Physical	2281	103.07	2.04	4.13	9

Note: All resource use measures are reported for a 28 day 'month'.

VI.E.3C Hierarchy III

Hierarchy III was developed by project staff in a synthesis process using features of the RUG-II system, Hierarchies I and II, and discussions within the Workgroup. The classification questions which this hierarchy was designed to address included:

1. Defining a Restorative Rehab group which used conditions which are responded to with rehabs are rather that the receipt of PT/OT/ST in order to overcome the situation of RNs delivering Rehab services.

2. Recognizing Workgroup discussion on the high resource consumption of unstable diabetic patients.

3. Separating patients with ADL plus skilled service needs from those with only ADL and/or IADL needs.

This classification is presented in Table (VI.18). The classification makes extensive use of diagnoses to define a Rehab group in order to address the Nursing Rehab definition problem. While some of the hierarchy categories show good resource use homogeneity, others show a high level of diversity.

The Workgroup review of the classification was very active and numerous suggestions on revising the definitions by swapping conditions were received. Among these where:

1. Use as a definition for the Rehab group the receipt of PT/OT/ST services. This provides an incentive to areas without such capacity to develop it so that the needed service cause delivered.

2. There needs to be a recognition of mental incapacity and/or impairment. In the Hierarchy III, this might be incorporated by dividing the last hierarchy group, Impaired Living Skills, into those with mental impairment and those with none.

3. Hemiplegia is often a result of a CVA. If the patient is receiving Rehab, then they should be classified there. If rehabilitation services are not given, they then should be put in the Special category.

4. The patient with Decubitus Stage 3 requires close monitoring and high resources and should be considered in one of the hierarchy groups.

5. Patients on respirators should all be receiving suctioning and these two conditions should be in same hierarchy.

TABLE VI. 18

Hierarchy III
Staff Synthesized Hierarchy

Group/Condition	Number of Patients	Total Cost
Restorative/ Recuperative of Major Motor Function	128	1512.55
1. CVA, Recent onset	21	2130.82
2. CVA, Late effects	16	1680.82
3. Intercerebral Hemorrhage	7	1077.80
4. Fx, Neck of Femur	3	733.25
5. Fx, Head of Femur	9	1745.26
6. Fx, Leg	24	1154.30
7. Fx, Both Legs	5	1044.91
8. Fx, 4 Extremities	1	1427.12
9. Multiple Sclerosis	7	2122.96
Special SERVICE		$1406.83
1. Quadriplegia	3	1436.96
2. Comatose	14	1081.04
3. Decubitus Grade 4	22	1924.64
4. Parenteral Feeding	21	1139.9
5. Suctioning	29	1255.6
6. Intravenous Injection	5	892
Complex Management	430	1123.99
1. Diabetes	92	1000
2. Dehydration	55	1057.48
3. Terminally Ill	143	1105.87
4. Internal Bleeding	87	1076.7
5. Respirator	8	922.16
6. Hemiplegia/ Hemparesis	105	1396.6
7. Transfusions	5	1070
Physical with Skilled Trints	735	940.54
1. Catheter Insertion	37	1342.1
2. Catheter Care	28	1340.6
3. Nurse Monitoring	12	898.5
4. Ostomy Care	15	844.8
5. Range of Motion	168	1174.6
6. Trach Care	1	210.28
7. Wound Care	122	1111.4
8. Stasis Ulcer	51	1187.2
Impaired Living Skills	904	924.92

Note: Resource use measures is reported for a 28 day 'month'.

Accompanying presentation of Hierarchy III was analysis of the relationship between mental status and resource consumption. (see Table VI. 19) This analysis showed that Mental status was a determinant of resource consumption differences among patients. Given this information, the choices of how to incorporate it into the classification were:

1. Treat it in the same manner as ADLs and IADLs as a partitioning characteristic within hierarchy categories, either before or after ADL/ IADL partitioning.

2. Use it as a hierarchy condition. The choice of where it should fall is a consideration of where in a high to low hierarchy the data indicates it should fall, how the condition overlaps with other categories whether and do those conditions dominate resource use, and the clinical perspective of the classification.

Consideration of these questions and the classification design answer to them is reflected in Hierarchy IV, the RUG-HHC Classification.

Table VI.19
Mental Status Characteristics versus
Resource Consumption.

Characteristic	Response	Mean Total Cost
Orientation	Good Mental Clarity	929
	Occasional Disorientation	1407
	Frequent Disorientation	1477
	Daily Disorientation	1778
	Total Disorientation	1857
	Unable to Determine	1804
Memory Deficit	Not Forgetful	859
	Occasionally Forgetful	1170
	Frequently Forgetful	1621
	Forgetful Daily	176
	Unable to Determine	1786
Impaired Desion Making	Not Impaired	915
	Occasionally Episodes	1206
	Frequent Episodes	1814
	Daily Episodes	1664
	Unable to Determine	1584

VI.E.3d Hierarchy IV, RUG-HHC Classification.

The RUG-HHC Classification is a 27 group classification with 6 hierarchy categories. The 27 groups are partitions under the six hierarchy categories using an ADL score (see earlier section) as the first partition characteristic followed by second level partitions for 6 groups in 3 hierarchy categories using an IADL score (see earlier section). The six hierarchy categories and the conditions for each are presented in table VI.20.

Table VI.20

RUG-HHC Hierarchy

Hierarchy Name	Condition
Rehabilitation	Two or more total hours per week of one-to-one skilled rehabilitation therapy by PT, OT and/or ST.
Special Care	Decubitus Grade 4 Dialysis Suctioning Comatose Quadriplegia Parenteral Fluids Daily Intravenous Injections Nasogastric Feeding Catheter Insertin and/or Care
Mentally/Behaviorally Impaired	Forgetful behavior at least once per week Inappropriate/Dangerous Decisions at least once per week Verbally disruptive at least once per week Physically Aggressive at least once per week Disruptive Behavior at least once per week
Complex Management	Dehydration Terminally Ill Internal Bleeding Hemiplegia Intravenous Transfusions Ventilator Decubitus Grade 3
Physical Impaired with Skilled Care Needs	Medications Management/Administration Nursing Monitoring Ostomy Care Range of Motion Tracheostomy Care Wound Care
Impaired Community Living Skills	Remaining Patients

Rehabilitation.

This hierarchy category contains those patients receiving two or more hours of restorative therapy per week from PT, OT and/or ST in combination or singly. A total of 4 Rehab groups are defined using the ADL score as the partitioning characteristic.

Group Title	ADL Score	Symbol
Rehab A	4	RA
Rehab B	5 - 6	RB
Rehab C	7 - 9	RC
Rehab D	10 - 19	RD

Special Care. Patients in this hierarchy category are characterized by a need for skilled nursing to perform services and to closely monitor patient condition. Patients generally have severe medical problems. There are 3 special care groups defined using ADL score as the partitioning charac- teristic.

Group Title	ADL Score	Symbol
Special A	4 - 6	SA
Special B	7 - 8	SB
Special C	9 - 19	SC

Mentally/Behaviorally Impaired. This hierarchy category consists of patients who, because of mental or behavioral problems, need assistance and monitoring to prevent actions by the patient which may be a danger to the patient or others. Two groups are defined in this hierarchy.

Group Title	ADL Score	Symbol
Mental A	4 - 7	MA
Mental B	8 - 19	MB

Complex Management. The patients in this category, while somewhat similar to Special Care patients, are characterized by lower skilled care needs. Three groups are defined in this category using ADLs and IADLs as partitioning characteristics.

Group Title	ADL Score	IADL Score	Symbol
Complex A	4 - 7	3 - 5	CA
Complex B	4 - 7	6 - 9	CB
Complex C	8 - 19	-----	CC

Physically Impaired with Skilled Needs. The use and need for skilled nursing care characterizes this patient category in addition to ADL and IADL needs. Five groups are defined within this hierarchy.

Group Title	ADL Score	IADL Score	Symbol
Physical A	4	3	PA
Physical B	4	4 - 9	PB
Physical C	5 - 8	3 - 5	PC
Physical D	5 - 8	6 - 9	PD
Physcial E	9 - 19	-----	PE

Impaired Community Living Skills. This category is characterized by patients principally needing assistance with ADL and IADL activities. Of all the hierarchy categories, this one has the highest number of groups with 10, twice as many as the next highest.

Group Title	ADL Score	IADL Score	Symbol
Impaired A	4 - 5	3 - 6	IA
Impaired B	4 - 5	7 - 8	IB
Impaired C	4 - 5	9	IC
Impaired D	6	3 - 5	ID
Impaired E	6	6 - 7	IE
Impaired F	6	8 - 9	IF
Impaired I	7 - 8	3 - 5	II
Impaired J	7 - 8	6 - 7	IJ
Impaired K	7 - 8	8 - 9	IK
Impaired L	9 - 19	-----	IL

For summary of the RUG-HHC, see Figure VI.D. Table VI.21 presents resource use measures by RUG HHC category. Figure VI.E and VI.F. show the distribution of patients by hierarchy and RUG-HHC category.

TABLE VI.21
Resource Use Measures by RUG-HHC Category

RUG-HHC	Number of Patients	Dependent Mean	Variable Stnd.Dev.	Mean Time/Month Nursing	Aide	Therapy
Rehab. A	20	1081	470	4.85	24.4	11.6
Rehab. B	50	1577	630	3.44	79.44	14.4
Rehab. C	57	1882	770	7.37	82.51	15.49
Rehab. D	77	2312	961	7.14	110.13	19.19
Special A	29	861	668	9.52	71.88	.21
Special B	13	1181	413	7.46	111.08	1.24
Special C	102	1477	890	9.62	129.1	.83
Mental/Behav.A	115	921	711	5.8	85.81	.48
Mental/Behav.B	303	1243	765	2.98	160.32	.71
Complex A	29	599	383	6.24	30.75	.86
Complex B	78	809	581	5.77	66.44	.79
Complex C	117	1271	901	6.24	131.75	.71
Physical A	38	456	345	7.50	1.26	.86
Physical B	94	635	534	8.31	23.71	.73
Physical C	69	671	395	5.99	41.57	1.06
Physical D	324	864	640	5.11	76.78	1.24
Physical E	130	1218	828	4.32	134.35	1.42
Impaired A	142	275	335	.89	34.32	.19
Impaired B	77	455	472	.68	63.54	.16
Impaired C	19	650	733	4.26	68.84	.00
Impaired D	42	387	253	.38	58.76	.00
Impaired E	104	704	502	.59	104.92	.08
Impaired F	97	979	517	.72	149.90	.09
Impaired G	14	455	466	.64	68.07	.00
Impaired H	27	798	385	.70	120.26	.30
Impaired I	69	1123	516	.77	171.77	.12
Impaired J	38	1440	591	.47	226.68	.21

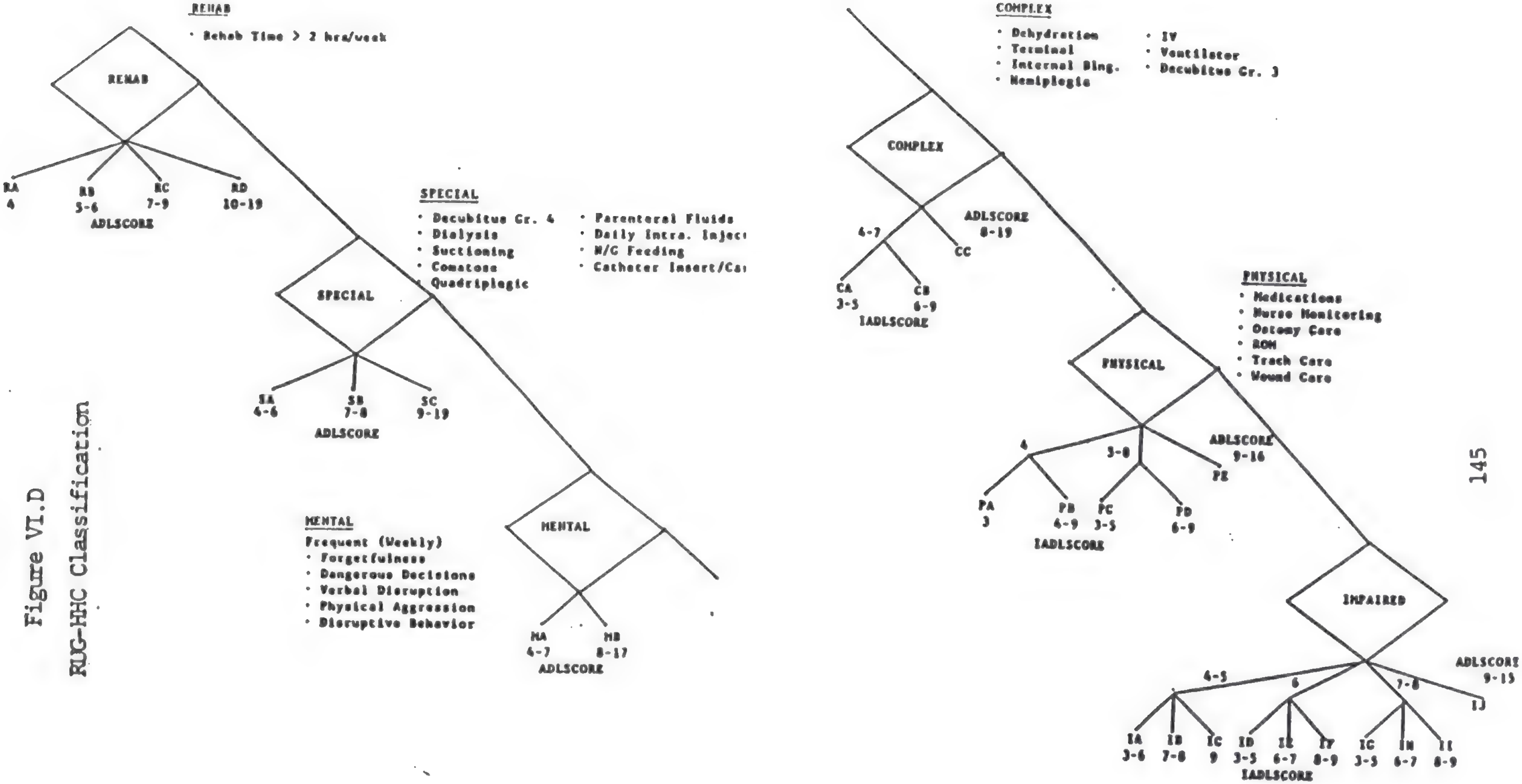
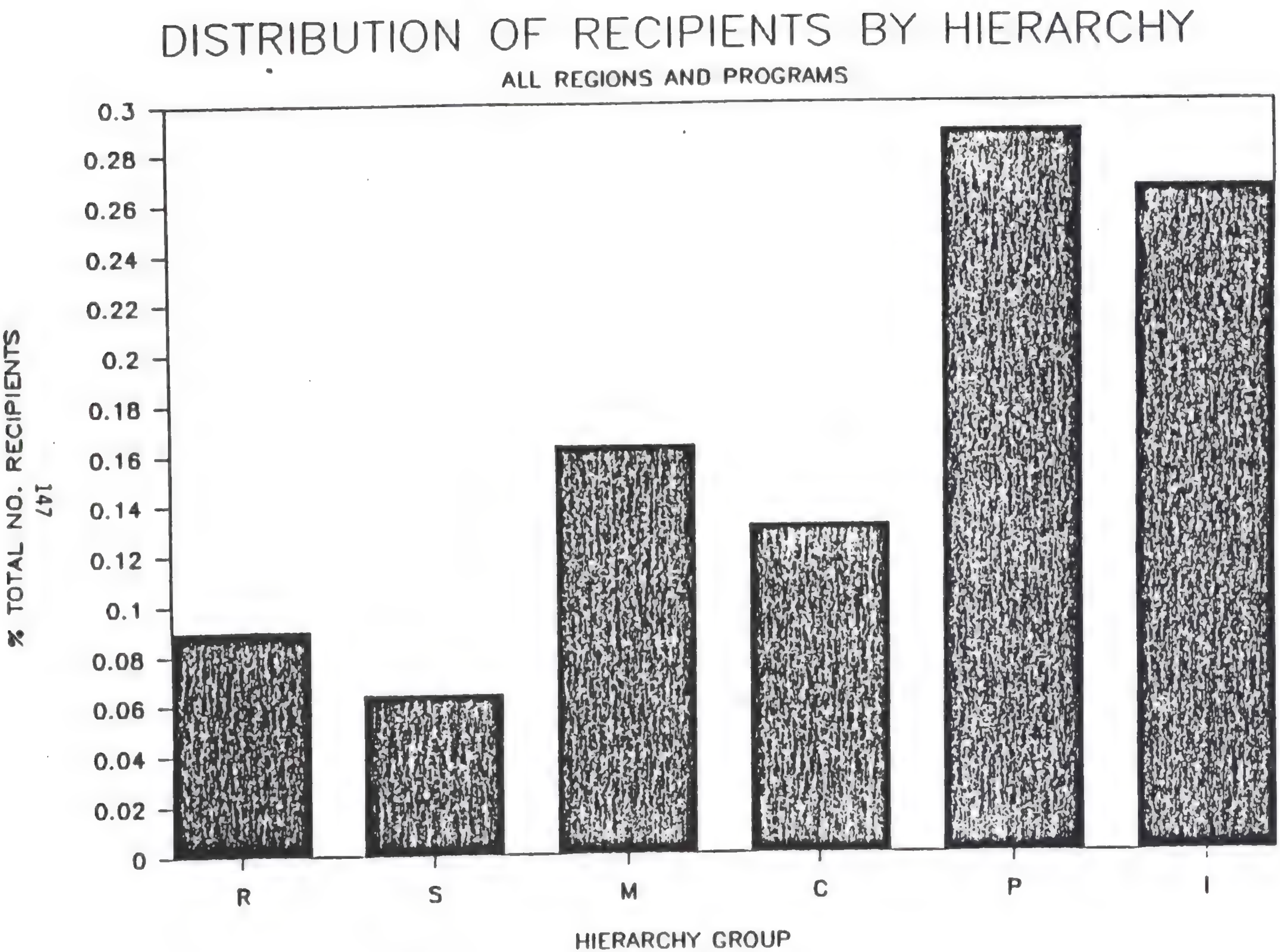


Figure VI.D
RUG-HHC Classification

Figure VII.A



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VI.E

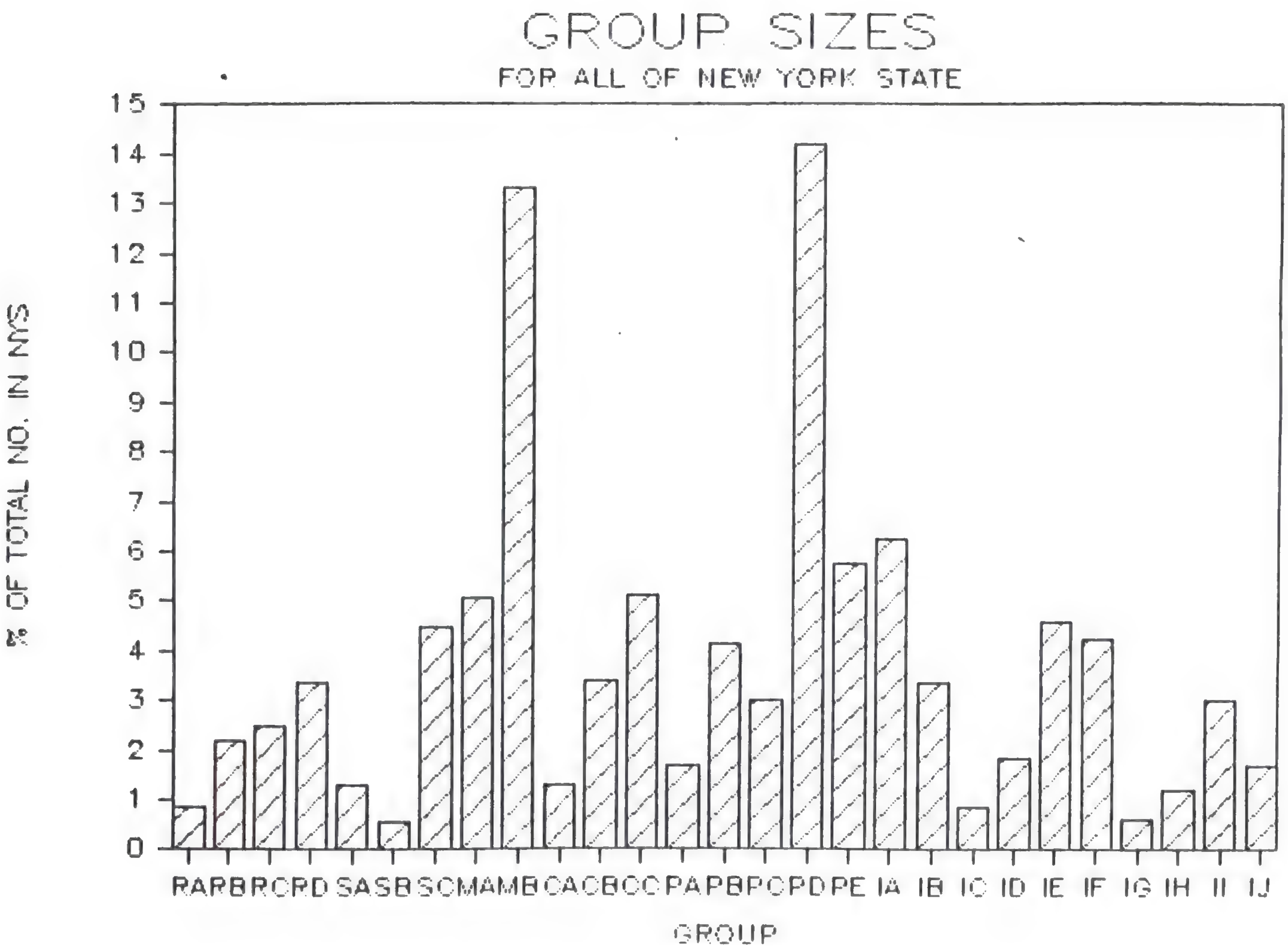

GROUP SIZES
FOR ALL OF NEW YORK STATE
% OF TOTAL NO. IN NYS
0
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
RA RB RC RD SA SB SC MA MB CA CB CC PA PB PC PD PE IA IB IC ID IE IF IG IH II IJ
GROUP

Figure VI.F

The RUG-HHC embodies many of the clinical features of the RUG-II system and on face value appears to sucessfully separate the clinical characteristics of home care patients. The real test of RUG-HHCs clinical features awaits the occasion of its clinical acceptance in the home care industry. While this is something that must await the passage of time, its performance as a resource predictor against the PATH data base can be reviewed now.

Table VI.22 presents the variance explanation, performance of the RUG-HHC classification for geographic and program sub populations of the data base. Note that there is no adjustment for presence or absence of informal supports.

Table VI.22

Percent Variance Explanation of RUG-HHC

Sub Population: Region	Sub Population: Program Type	Percent Variance Explanation
NYC	PC	59.9
NYC	CHHA	27.42
NYC	All	35.8
Upstate	PC	37.7
Upstate	CHHA	27.3
Upstate	All	30.2
All	PC	47.4
All	CHHA	26.3
All	All	30.6

Note: No adjustment for presense or absence of informal supports.

The classification's explanatory power is best in those programs, controlling for geography, where the payor influence on how much and what type of services is eliminated because there is only one payor; notably, the Personal Care/Home Attendent program. Across the whole PATH database, without any adjustments for informal supports, geographic differences, and different payor policies on reimbursable services, variance explanation stands at 30.6 percent. If adjustments were possible for each of these, the indication from the results in table VI.22 is that this would increase significantly. With the RUG-HHC classification, it may be possible in future research to isolate these effects since the RUG-HHC provides a mechanism for controlling for patient type.

VII. HOME CARE PROGRAM BOUNDARIES

A boundary is something that indicates or fixes a limit or extent. In a health care delivery system such as home care, boundaries between components of the system are determined by the condition of patients that can be cared for, the services that can be delivered through the program, and limits that are set on the volume of services that can be given in a program.

In this section of the report, the boundaries between three types of home care programs, the Personal Care/Home Attendant (PC), Long Term Home Health Care (LTHHC) and Certified Home Health Agency (CHHA) are explored. This exploration is done in several ways. First, the capabilities of programs as stated in statute and regulations are presented. Second, a patient profile of each program is presented which contrasts the characteristics of patients in each program and compares home care patient characteristics to institutionalized long term care patients. Third, the relative costs, using a casemix index approach, of caring for patients in the different type of home care programs is analyzed. Included in this analysis is consideration of factors aside from patient characteristics which influence costs including location differences of programs and informal support system availability.

The analysis findings lead to conclusions and recommendations on changing the pattern of patient referral and use of home care programs. These recommendations are oriented to better matching program capabilities with patient need and to achieve economics when a better match is achieved.

VII.A. DESCRIPTION OF HOME CARE PROGRAMS

A home care program is defined by the rules which govern its operation. These rules specify the medical conditions of patients appropriate for the program, the services which are part of the program, and the limits on volume of services that can be given an individual patient. In this part of the report, a summary of the rules governing the Personal Care/Home Attendant Program, the Long Term Home Health Care Program, and the Certified Home Health Agency is presented.

VII.A.1 Personal Care/Home Attendant Program

The personal care services program (PC) is administered by the Department of Social Services and is the largest home care program in New York State. Personal care is aimed at maintaining a person in their home by providing assistance to recipients in personal hygiene, dressing, feeding, nutritional support, environmental support and limited health related tasks.

Patient Condition. To qualify for the program, the patients medical condition must be stable. A stable medical condition is defined as one where it is not expected to exhibit sudden deterioration or improvement, does not require frequent medical or nursing judgement to determine changes in patient's plan of care, and does not need skilled professional care in the home. Further, except for short durations, the patient must

be capable of making choices about his/her activities of daily living with full recognition of the impact of the choice and assumption of the responsibility for results of the choice.

Allowable/Required Services. The scope of services in PC is defined by the tasks/activities that the personal care aide can perform to assist the patient in daily living activities and in following a treatment regimen. These tasks include light housekeeping, dishwashing, shopping, laundry, bill payment, bathing, dressing, grooming, toileting, walking, transferring, meal preparation, feeding, patient self administration of medication, routine skin care, assistance in use of medical supplies and equipment, simple dressing change, observing that the patient follows medication regimen, assisting patient with maintenance program of therapy and assisting patients with ostomy care.

Service Plan. The plan of services which a patient needs is determined by the local social services district taking into consideration an order by the patient's physician, an assessment of the patients medical condition by home care nursing staff, and a social assessment of the patients motivation, living situation, and informal suport structure. This plan must be updated at a minimum, every six months or in some circumstances, yearly, if the patient condition during the life of the plan remains stable such that no modification is necessary. Payment to the provider of services is made on a 'services given' basis providing services are authorized under the service plan.

VII.A.2 Long Term Home Health Care Program

The Long Term Home Health Care Program (LTHHCP) is jointly administered by the Department of Social Services and the Department of Health. The LTHHCP, also known as the 'Nursing Home Without Walls', was created to provide the equivalent of nursing home care to patients in their own home by establishing both a service system and a service payment mechanism under the Medicaid Program.

Patient Condition. The patient's medical condition must be such that the patient would meet admission criteria for nursing home care at either the Health Related Facility (HRF) or the Skilled Nursing Facility (SNF) level of care. These conditions include that the patient not be in an acute phase and that they meet level of care criteria measured through the DMS-1 level of care determination system.

Allowable/Required Services. Required Services under the LTHHCP parallel those available in nursing homes and include nursing, aides, medical supplies, equipment and appliances, physical therapy, occupational therapy, respiratory therapy, speech pathology, medical social work, nutrition assistance, personal care, homemaker and housekeeper. A provider may also incorporate into their services home maintenance, moving, assessment, housing improvement, respite, social day care, transportation and congregate meals.

Service Plan. The service plan for the patient is determined through patient assessments by the patient physician, local social services staff, and nursing staff of the LTHHCP. The service plan is subject to a

budget cap equal to 75 percent of the area's prevailing nursing home rate. This plan must be updated at a minimum every 4 months when the patient's condition changes such that the plan is no longer appropriate.

VII.A.3 Certified Home Health Agency

The Certified Home Health Agency (CHHA) is a provider of home care services regulated by the Department of Health. The principal payor for CHHA services is Medicare. CHHA's are generally thought of as a resource for in home skilled professional services in conformance with Medicare's definition of reimbursable home health care.

Patient Condition. The patient in a CHHA must be in need of preventative, supportive, or restorative care and these needs must be determined to be best met at home. This definition is broad enough to include patients in need of post acute skilled care, chronic long term care, and public health services.

Allowable/Required Services. The services that a CHHA can be certified for include nursing, home health aide, medical supplies/equipment, applicances, physical therapy, occupational therapy, speech pathology, nutrition, and medical social work.

Service Plan. The service plan for a patient is determined by the CHHA with approval of the patient's physician. For many patients in a CHHA, the service plan is dynamic since it must respond to the rapidly changing status of the patient. Because of the dominance of Medicare as a payor, many patient service plans follow the Medicare model of home care of short term skilled care in support of recovery from an acute illness with a limit of 100 home care visits per year.

VII.A.4 General Program Roles

The discussion above leads to an operating definition of roles in home care of each program as follows:

PC. Medically necessitated personal care services for mecially stable patients not needing skilled care and observation.

LTHHCP. Medically necessitated personal care and skilled professional services for the chronically ill.

CHHA. Medically necessitated skilled care services for patients recovering from acute illness.

In the next paragraphs, each program is profiled with the patients found in the program. The purpose of this profiling is to portray the program boundaries as they relate to characteristics of the patients found in each.

VII.B PATH DATA COMPARISON OF HOME HEALTH CARE PROGRAMS.

The three major home health care programs in this study have different perceived roles in the spectrum of care delivery. Broadly speaking,

CHHAs focus on short-stay, acute care residents, in contrast to the other two programs. LTHHC residents require a variety of needs with on-going services, while PCPs provide relatively little medical care, but rather more daily living services.

We found, however, that these perceptions were at least partially at variance with the roles that these agencies actually play, as seen in the characteristics of recipients. Table VII.1 compares the three programs on a variety of individual characteristics assessed in the PATH instrument, and contrasts these, where possible, with data describing residents of New York State's Residential Health Care Facilities (RHCFs - nursing homes), collected in the New York State Long-Term Care Case Mix Reimbursement Project and Medicare Skilled Nursing Facility patients from our five state study. It should be noted that the New York RHCF sample was purposefully biased towards heavy care patients.

The differences in program goals of the three HHC programs are seen in the referral reasons, with CHHAs dominated by patients who have just been discharged from hospitals after stays for acute conditions and who are expected to recover and return to previous functional levels. In contrast, the LTHHC and PC programs care for patients with deterioration of function and who will continue to have a need for home care services. However, the post acute nature of the CHHA patients is not reflected in patient medical problems; there seems to be no particular pattern between the three programs, although CHHAs care for the majority of the terminally ill patients. In contrast, RHCF facility patients have far fewer medical problems, although the Medicare cohort is more like the home care population.

Although all the details are not displayed in Table VII.1, in every Activity of Daily Living (toileting, eating, transfer, mobility, personal hygiene, bathing, and dressing) and in ability to see and hear, express oneself and understand, the home care population is more functional and less dependent than the institutionalized population. Within the home care sector, the PC recipients were almost uniformly the most functional and the LTHHC recipients the least.

The nursing home population is also more differentiated on mental and behavioral dimensions, where they had more problems than any other population studied. The institutionalized population also exhibits greater prevalence of problems on mental and behavioral dimensions. Of the home health care recipients, the PC program had the lowest prevalence of problems.

Direct comparison of individual characteristics has a major potential problem. Individual characteristics are highly intercorrelated, yet have different importance in understanding the resource use of recipients. Thus a more integrative measure needs to be used to contrast the programs. The RUG-HHC system is used here to provide such an overview.

Figure VII.A. shows that the CHHAs have the largest percentage of the heaviest care recipients, the rehabilitation, special care, and clinically complex patients, and commensurately only a very few of the impaired groups. It is, however, surprising that 42% of their recipients are in the reduced physical functioning groups with none of the serious medical or rehabilitation needs that define the earlier hierarchy groups.

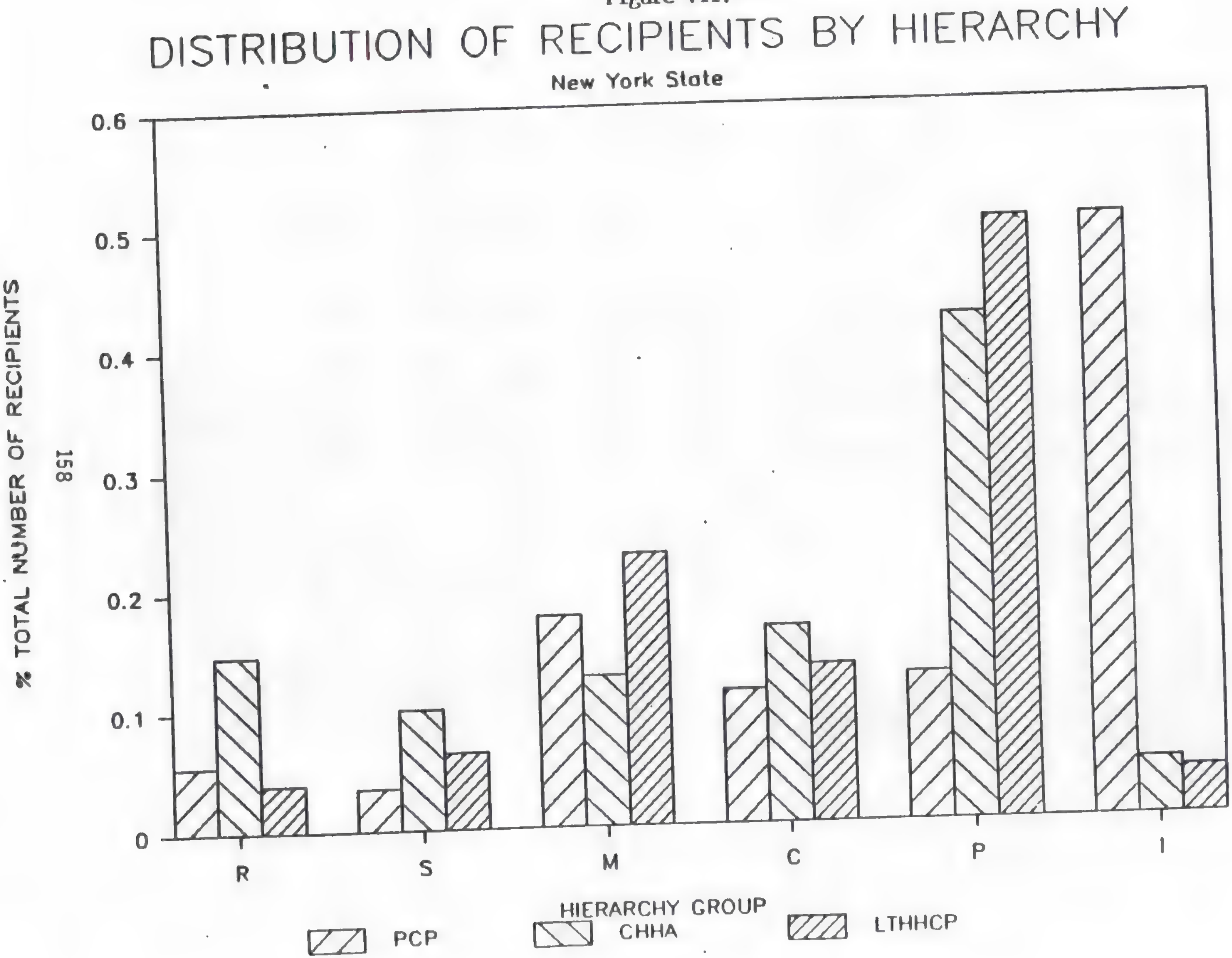
Table VII.1

Comparison of Recipient Characteristics in Home Health Care and Two Other Studies

	PCP	CHHA	LTHHC	NYS	MCARE
Number of sample	1075	942	317	3427	2564
Referral Reason					
Recent Illness w/ hosp.	9.8%	63.3%	23.3%		
Flare of condition w/ Hosp	2.5%	16.4%	11.4%		
Flare of conditon w/o Hosp	3.2%	4.7%	4.7%		
Deterioration	78.8%	13.3%	43.2%		
Other	[illegible].7%	2.3%	17.4%		
Goal of services					
Return of previous function	1.2%	39.7%	0.9%		
Discontinue HC	1.9%	32.7%	6.9%		
Maintian HC	95.3%	20.4%	90.9%		
Support End Stage	1.6%	7.9%	1.3%		
Care Factors					
Amputation	3.3%	5.2%	6.3%		5.8%
Bleeding - int.	1.0%	7.1%	5.8%	2.9%	
Brace	3.8%	7.9%	8.2%		7.1%
Comatose	0.0%	1.0%	1.6%	1.4%	2.7%
Decubiti (Grade 4)	0.4%	1.7%	0.6%	1.1%	4.7%
Dehydration	0.7%	4.9%	2.3%	1.3%	3.0%
Dyspnea	29.5%	27.9%	26.1%	4.7%	9.7%
Edema-pitt.	17.2%	25.6%	20.3%	15.1%	6.7%
Hyper/Hypoglyc.	3.8%	14.4%	21.5%		22.5%
Pain	16.0%	18.1%	9.8%	8.0%	8.9%
Statis Ulcer	2.4%	6.7%	5.8%	1.3%	8.5%
Terminal	1.7%	13.2%	4.9%	1.4%	9.3%
Trachestomy	0.0%	0.7%	1.6%		2.5%
Vent/respirator	0.3%	0.1%	1.6%		0.1%
Wound infect	1.4%	11.4%	6.2%		
ADLs					
Eating					
Independent (or w/ equipment	78.8%	70.0%	60.3%	22.1%	40.9%
By hand	3.5%	3.4%	4.4%	19.2%	10.1%
Tube/Parenteral	0.1%	2.1%	0.3%	2.8%	11.5%
Transfer					
Independent	68.6%	55.0%	65.6%	29.5%	6.9%
Bedfast	1.7%	1.6%	1.9%	0.9%	7.6%
Toileting					
Independent	66.8%	59.0%	63.7%	27.[illegible]	8.1%
Total assistance	3.7%	4.7%	4.1%	10.4%	4.8%
Incontinent-not toileted	5.1%	6.6%	6.9%	17.7%	26.3%
Incontinent - toileted	1.3%	1.1%	2.8%	20.3%	2.1%
Speaks and understoods	90.8%	87.2%	81.7%	66.6%	
Generally understands	91.2%	86.9%	78.5%	57.4%	
Adequate hearing	73.9%	76.4%	68.1%	47.7%	66.2%
Sees well or adequately	83.2%	87.2%	78.6%	74.6%	88.1%
Mental characteristics					
Clearly oriented outside	80.5%	79.9%	73.0%		
Not forgetfull	64.9%	67.5%	55.5%		
No verbal disruption	95.1%	93.0%	91.8%	69.4%	92.6%
No physical aggression	98.3%	96.8%	98.1%	78.7%	96.0%
No infantile/inappropriate behavior	98.6%	96.8%	98.4%	65.3%	93.5%

LEGEND:
PCP: Personal Care/Home Attendant
CHHA: Certified Home Health Agency
LTHHC: Long Term Home Health Care
NYS: New York State Nursing Home Residents, RUG-II Developmental Database
MCARE: Five State Study of Medicarte SNF Patients, Rensselaer Polytechnic Institute.

Figure VII.A



DISTRIBUTION OF RECIPIENTS BY HIERARCHY
New York State
0.6
0.5
0.4
0.3
0.2
0.1
0
% TOTAL NUMBER OF RECIPIENTS
R
S
M
C
P
I
HIERARCHY GROUP
PCP
CHHA
LTHHCP

The LTHHC programs, targeted at a patient population somewhat akin to that in nursing homes, does exactly that: the percentages of patients in each of the groups are roughly those seen for the RHCF population in New York. However, the LTHHCP cares for a population that is somewhat equivalent to that of the Personal Care Program in the four highest hierarchy classifications - Rehabilitation, Special Care, Mental/Behavioral, and Clinically Complex. Thus for almost fifty percent of their caseload, these programs are similar. Only in the last two hierarchy classes are the programs markedly different. The LTHHCP cares for many more of the reduced physical functioning patients and almost none of the impaired, since it provides care only for patients in need of skilled nursing services. The PCP cares for almost all of the impaired in home care sector.

A second way to examine the characteristics of each program is to examine each program's case mix. The case mix of a program reflects the relative intensity of patients in one program to another program. Comparison of case mix can be done at the RUG-HHC level by comparing the percent of patients in a program to the percent in other programs or at a program level by computing the average casemix for the program. Both require computing a case mix index for each RUG-HHC category. The procedure used and results are presented below.

VII.C. METHODOLOGY FOR DERIVING CASE MIX INDEX

The case mix index (CMI) represents a relative measure of utilization of resources, in other words, a comparison of the resource consumption between the case mix groups. The steps used to derive the CMI are as follows:

1. Determine cost measure for each patient. The analysis used to develop the case mix groups was based upon a salary weighted resource consumption variable. For each patient a cost/month measure was computed by taking the hours/month for each type of direct care personnel and multiplying by the salary/hour for that type of personnel. The salary levels used were those in a single region, thus the costs across all programs, across all regions could be compared on an equal basis (if these costs were to be converted to reimbursement rates, a wage equalization factor would have to be employed to convert the figures to specific regional wage levels).

2. Determine average cost for each group. The average cost for each group is found by classifying the patients into the RUG-HHC groups and computing the average of the individual cost measures for all the patients in the group.

3. Determine average cost for all patients. The average cost across all patients in the sample was computed (the average in our data base was $1,002 per month).

4. Calculate the case mix index for each group. The case mix index for each group is determined by dividing the result found in step (2) by the result in step (3). The resulting ratio is the CMI. The average value for the CMI is 1.0 (since it is calculated based upon a ratio of the average cost per patient). A CMI of 2 indicates that group is twice as expensive as the average, and a .5 indicates the group is 1/2 as expensive as the average. As an example, the cost per month for the Physical A group is $456, thus the CMI for the group is 456/1002, or .455.

The reason for developing a case mix index, rather than simply using the dollar per month cost is the ease of use of the CMI in many applications. It shows the relative intensity of patients in any program or agency. For example, if a particular agency computed the average CMI of all their patients, and it was 1.20, this would indicate their case mix was 20% more expensive than the average case mix in the state. In addition, the CMI is independent of inflation and wage factors. Thus once the CMI is calculated, it can be used in future years within all regions of the state. Each year inflation is applied to the dollar value that is attached to the CMI. For example, in our data base $1,002 per month would be attached to a CMI of 1.0 (these figures should not be taken as representative of all programs in NYS, since regional wage factors have not been applied, and proportional representation for all sectors was not the objective of the original sample). A 5% inflation would mean that a CMI of 1.0 would be worth $1,052.

Figure VII.B and Table VII.2 present results for all patients in the sample. Figure VII.B shows the CMI ranges from a low of .27 for the Impaired A to a high of 2.31 for the Rehab D. Within each hierarchy group, the impact of the ADLs (and ADLs for the Impaired group) is clearly visible. For example, the range in CMI within the Physicial group is from a low of .46 to Physical A (independent range for ADL) to a high of 1.21 (dependent range for ADL). Table VII.2 shows the dominance of health aides and personal care aides in the staffing mix across all RUG-HHC groups. The highest average level of RN time is 9.5 hours per month (Special A), and very little RN time is spent on patients in the Impaired hierarchy. As would be expected, PT, OT, and ST time is largely limited to patients in the Rehab hierarchy groups.

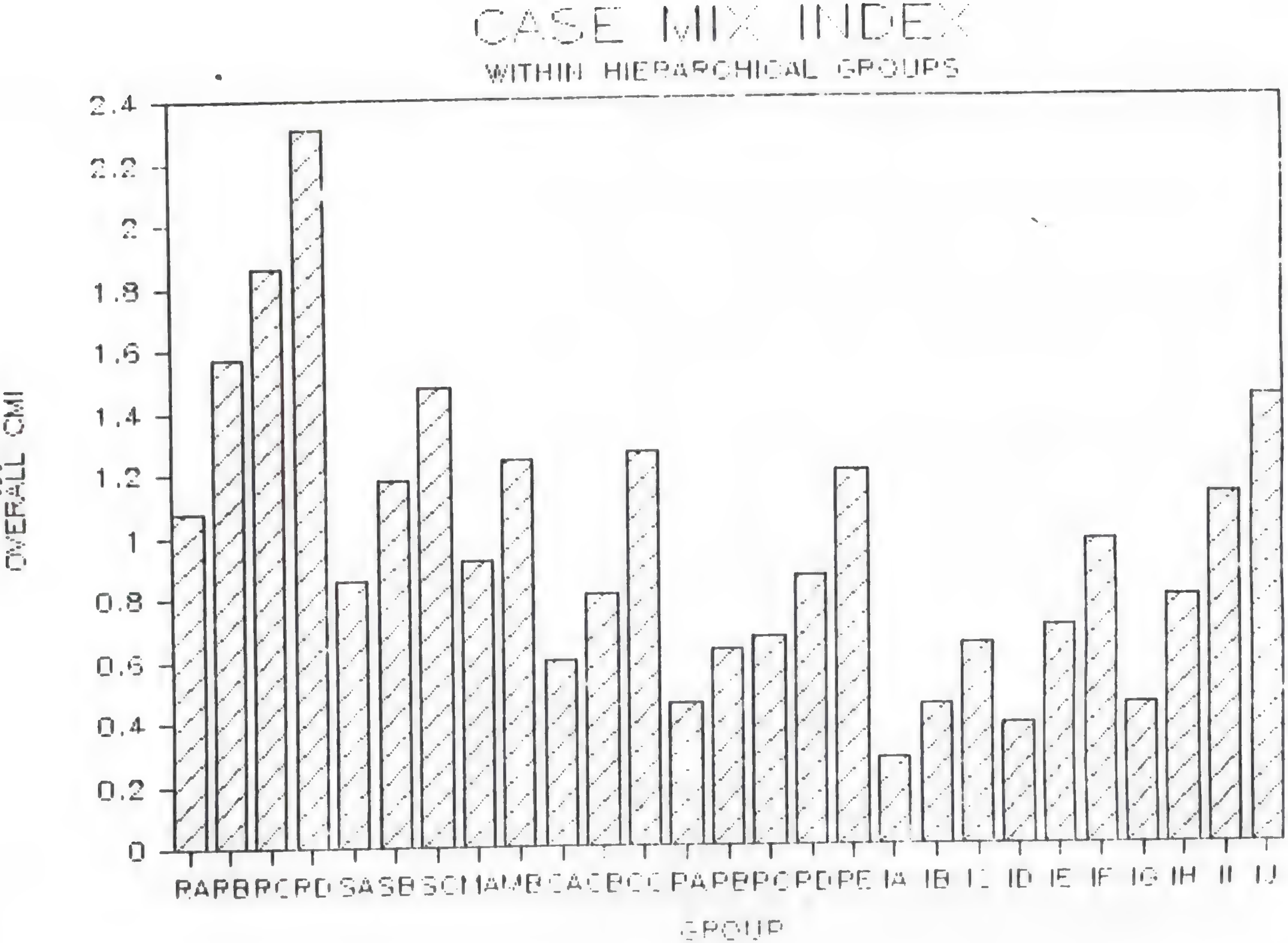

CASE MIX INDEX
WITHIN HIERARCHICAL GROUPS
OVERALL CMI
2.4
2.2
2
1.8
1.6
1.4
1.2
1
0.8
0.6
0.4
0.2
0
RA RB RC RD SA SB SC MA MB CA CB CC PA PB PC PD PE IA IB IC ID IE IF IG IH II IJ
GROUP

Figure VII.B

Table VII.2

ALL OF NEW YORK STATE

GROUP	SIZE	TOTAL COST	CMI	<---- MEAN TIME PER MONTH ---- RN	LPN	HLTH AIDE	HMKR	PER AIDE	ENV AIDE	PT	OT	ST
ALL	2280	1002	1.00	4.16	0.10	14.22	1.73	79.43	3.61	1.37	0.47	0.22
REHAB A	20	1081	1.08	4.85	0.00	0.00	0.80	15.60	8.00	7.20	2.40	2.00
REHAB B	50	1577	1.57	3.44	0.00	19.52	0.00	57.04	2.88	8.00	4.32	2.08
REHAB C	56	1868	1.86	7.23	0.14	20.43	0.00	59.79	2.29	8.93	4.77	1.79
REHAB D	77	2312	2.31	7.14	0.00	42.70	2.75	64.16	0.52	11.69	5.06	2.44
SPECIAL A	29	861	0.86	9.52	0.00	7.03	2.76	42.90	0.00	0.21	0.00	0.00
SPECIAL B	13	1181	1.18	5.31	2.15	9.23	0.31	101.23	0.31	0.62	0.62	0.00
SPECIAL C	102	1477	1.47	8.84	0.78	39.18	0.08	89.45	0.39	0.75	0.06	0.00
MENT/BEHAV A	115	921	0.92	5.63	0.17	17.67	0.00	65.32	2.82	0.38	0.03	0.07
MENT/BEHAV B	303	1243	1.24	2.94	0.04	16.55	1.53	141.12	1.12	0.58	0.05	0.04
COMPLEX A	29	599	0.60	6.24	0.00	9.79	0.41	10.21	10.34	0.72	0.14	0.00
COMPLEX B	78	809	0.81	5.77	0.00	15.28	1.56	47.39	2.21	0.69	0.05	0.05
COMPLEX C	117	1271	1.27	6.21	0.03	27.11	2.09	102.55	0.00	0.58	0.10	0.03
PHYSICAL A	38	456	0.46	7.50	0.00	1.26	0.00	0.00	0.00	0.66	0.21	0.00
PHYSICAL B	94	635	0.63	8.10	0.21	3.11	4.26	9.79	6.55	0.60	0.00	0.13
PHYSICAL C	69	671	0.67	5.87	0.12	12.41	0.70	28.00	0.46	1.06	0.00	0.00
PHYSICAL D	324	865	0.86	5.00	0.11	15.77	1.40	59.26	0.35	1.06	0.17	0.01
PHYSICAL E	131	1209	1.21	4.20	0.12	21.62	0.67	110.29	1.77	1.13	0.11	0.18
IMPAIRED A	142	275	0.27	0.89	0.00	1.72	4.20	10.54	17.86	0.19	0.00	0.00
IMPAIRED B	77	455	0.45	0.68	0.00	5.40	2.08	31.38	24.68	0.16	0.00	0.00
IMPAIRED C	19	650	0.65	4.26	0.00	0.00	1.68	62.11	5.05	0.00	0.00	0.00
IMPAIRED D	42	387	0.39	0.38	0.00	1.14	5.43	49.43	2.76	0.00	0.00	0.00
IMPAIRED E	104	704	0.70	0.59	0.00	6.00	1.85	93.69	3.38	0.08	0.00	0.00
IMPAIRED F	97	979	0.98	0.68	0.04	2.52	1.03	143.59	2.76	0.09	0.00	0.00
IMPAIRED G	14	455	0.45	0.64	0.00	0.00	1.21	66.29	0.57	0.00	0.00	0.00
IMPAIRED H	27	798	0.80	0.70	0.00	0.00	1.48	118.48	0.30	0.30	0.00	0.00
IMPAIRED I	69	1123	1.12	0.77	0.00	4.06	3.25	162.20	2.26	0.12	0.00	0.00
IMPAIRED J	38	1440	1.44	0.47	0.00	0.00	0.00	223.00	3.68	0.21	0.00	0.00

VII.D RUG-HHC DISTRIBUTION AMONG PROGRAMS.

This part presents results on looking at the difference in case mix between programs at the RUG-HHC category level.For each program the percentage of patients in each of the RUG-HHCs categories, as shown in Figure VII.C., was determined. Figure VII.D - VII.F display the differences (positive and negative) between a program's percentage and the percentage of all home care patients in that RUG. For example, a total of 104 PCP patients, or 10.2%, were classified in the "Impaired A" (IA) RUG-HHC group. Overall, 5.4% of all patients in the sample were in the IA group, so the PCP has 4.8% more of the IA patients than the home care population in general; this is displayed as the first bar on Figure VII.D. To view the case mix more easily, the RUG-HHC categories in these three tables were arrayed with increasing case mix index from left to right. Thus IA is the least costly RUG-HHC, "Rehabilitation D" (RD) the most expensive.

An examination of Figures VII.D - VII.F shows that the PCP cares for more of the very light care patients (the left side of the figure) and few of the very heavy categories -- the rehabilitation categories -- with the exception of the heavy care impaired (II and IJ). In contrast, the CHHAs care for these very heavy care rehabilitation patients but fewer of the impaired. The LTHHCP is interesting in that it treats more patients in the middle of the spectrum of care, with fewer of either the very resource-intense of resource-light recipients. It may be that the light care patients do not meet the skilled nursing requirements of the LTHHC programs, while the heavy care, expensive patients are avoided as they cannot be fully reimbursed under the cost ceiling to which the LTHHC programs are subjected.

VII.E. ANALYSIS OF CASE MIX AND COST DIFFERENCES

While patient characteristics, such as those measured within the RUG-HHC, are good predicators of revenue consumption, other non-patient characteristics also influence the resources consumed by a patient. These include availability of informal supports and regional differences in patterns of resource availability and use. RUG-HHC allows analysis of these factors since patient case mix can now be controlled for.

In this part of the report, region, program, and informal support availability are investigated as explanatory factors of differences in patient's use of home care resources after adjustment for case mix. The results of the analysis have implications in the use of the RUG-HHC as a basis for resource allocation in home care through either resource targets or reimbursement.

VII.E.1 Regional Analysis

Figure VII.G. and Tables VII.3 to VII.5 show the results found by classifying all the patients within a region. Caution should be applied in interpreting the results since the program and informal support are not controlled for in these figures and tables. The major results from these tables are as follows:

Figure VII.C

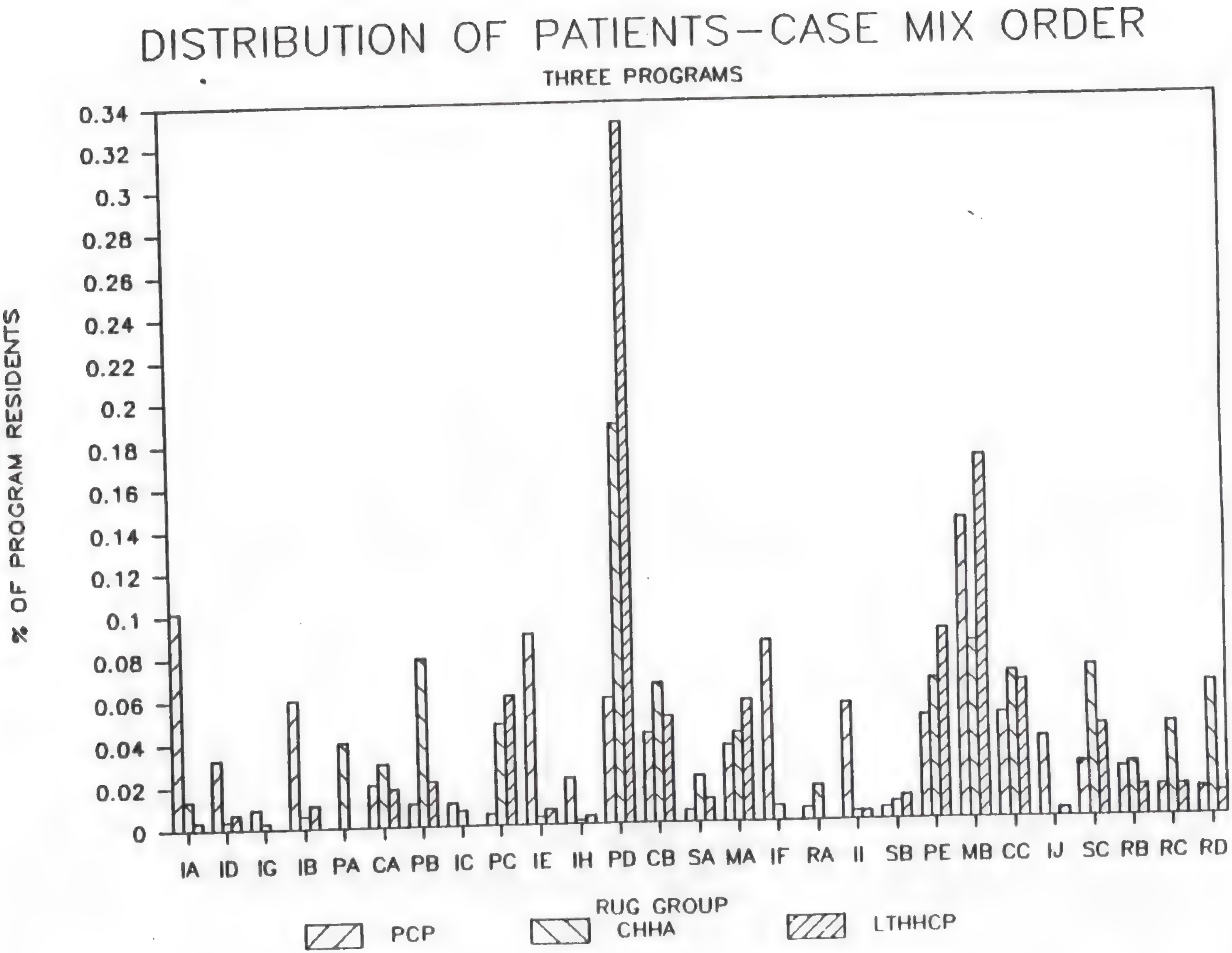


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Figure VII.D

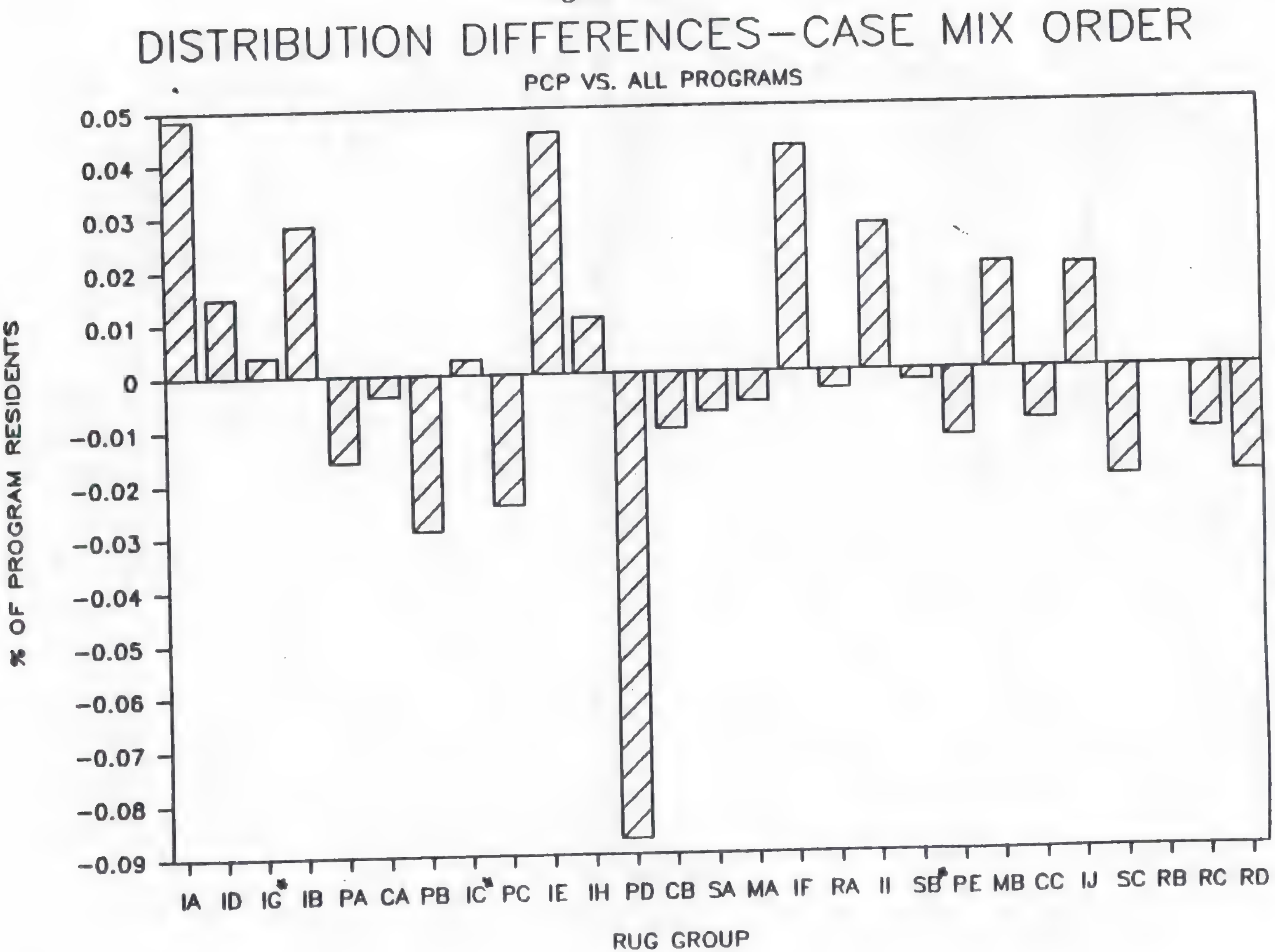
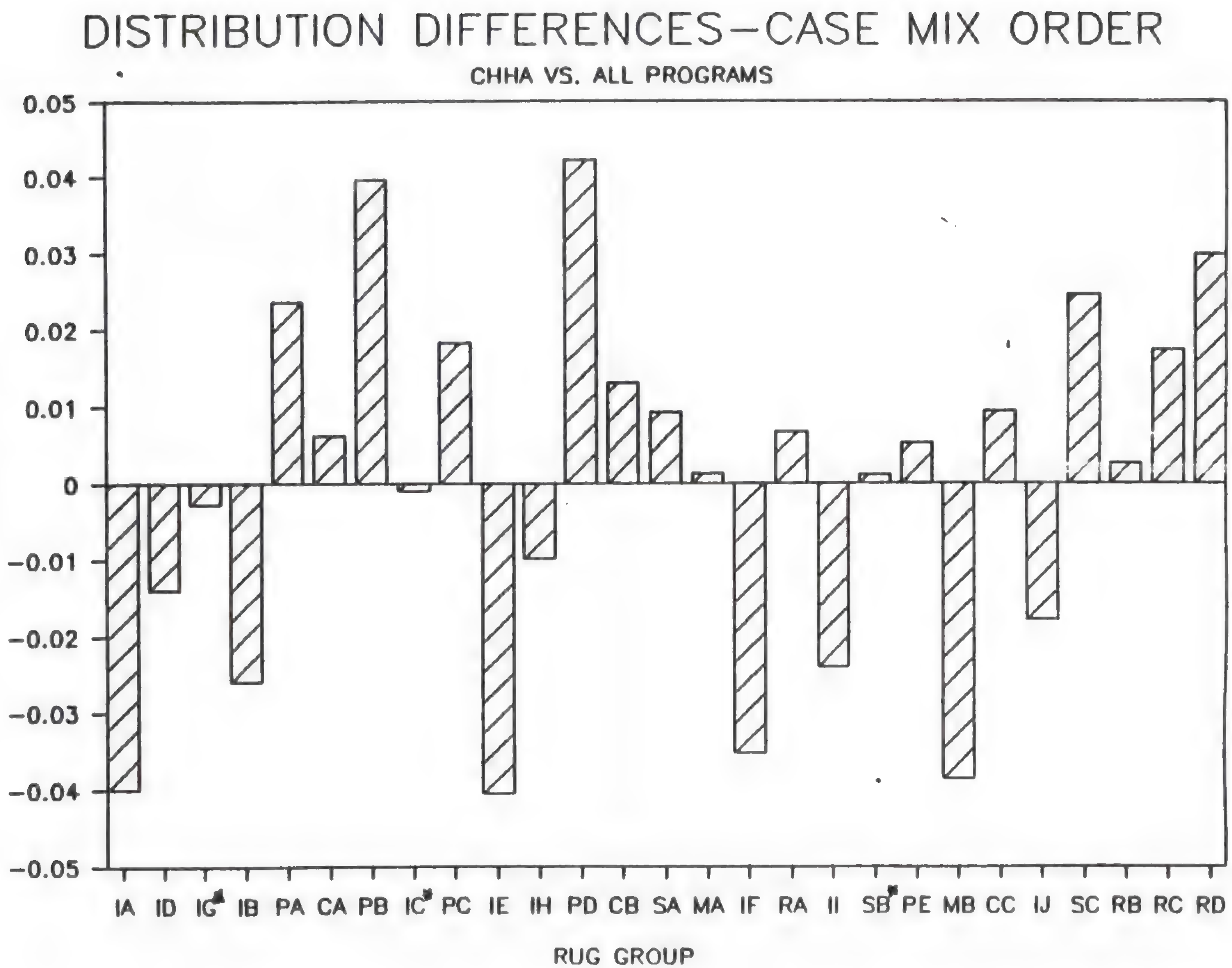
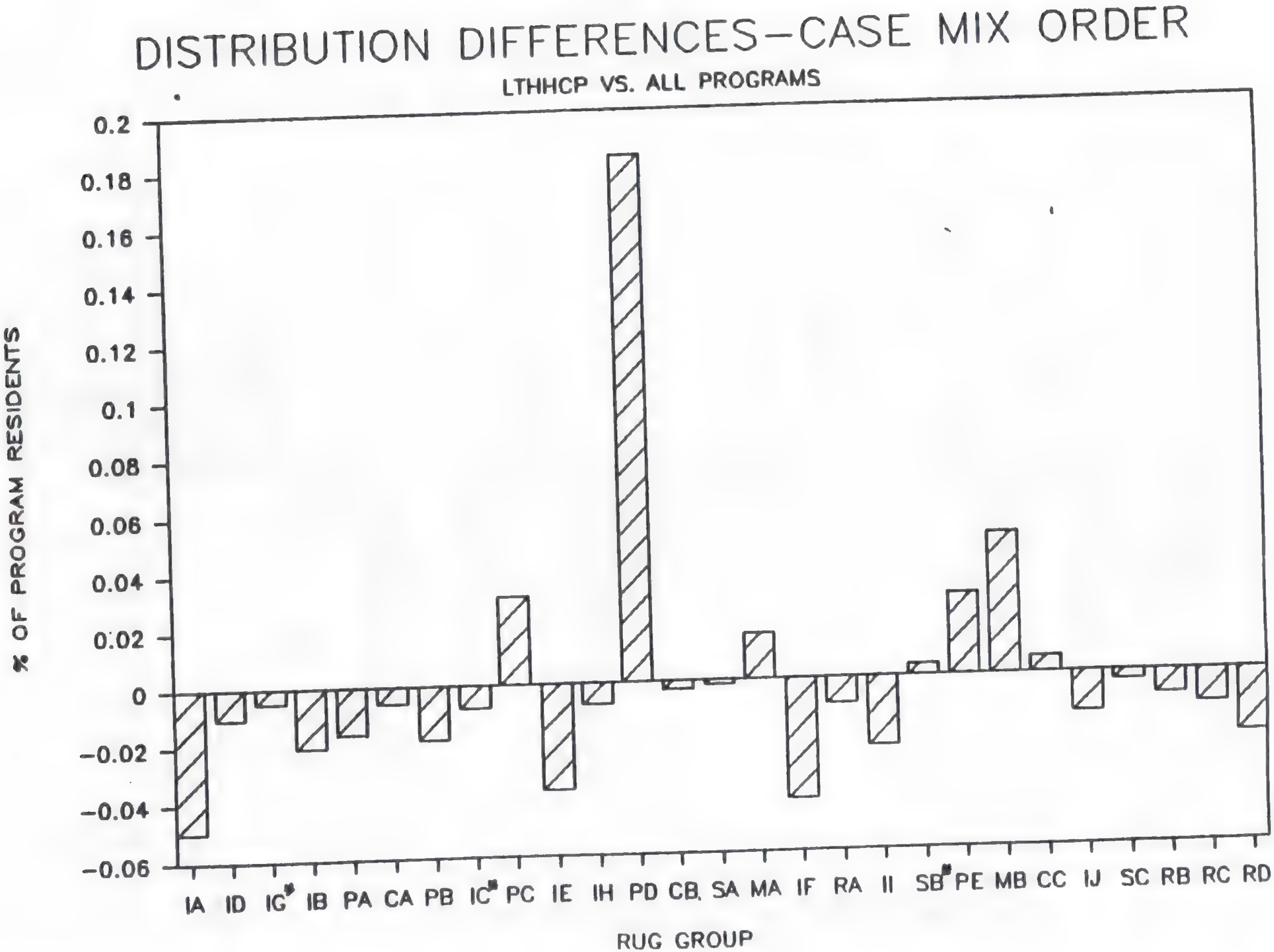

DISTRIBUTION DIFFERENCES—CASE MIX ORDER
PCP VS. ALL PROGRAMS
% OF PROGRAM RESIDENTS
0.05
0.04
0.03
0.02
0.01
0
−0.01
−0.02
−0.03
−0.04
−0.05
−0.06
−0.07
−0.08
−0.09
IA ID IG* IB PA CA PB IC* PC IE IH PD CB SA MA IF RA II SB* PE MB CC IJ SC RB RC RD
RUG GROUP

Figure VII.



DISTRIBUTION DIFFERENCES—CASE MIX ORDER
CHHA VS. ALL PROGRAMS
% OF PROGRAM RESIDENTS
0.05
0.04
0.03
0.02
0.01
0
−0.01
−0.02
−0.03
−0.04
−0.05
IA ID IG* IB PA CA PB IC* PC IE IH PD CB SA MA IF RA II SB* PE MB CC IJ SC RB RC RD
RUG GROUP

Figure VII.F



DISTRIBUTION DIFFERENCES—CASE MIX ORDER
LTHHCP VS. ALL PROGRAMS
% OF PROGRAM RESIDENTS
0.2
0.18
0.16
0.14
0.12
0.1
0.08
0.06
0.04
0.02
0
−0.02
−0.04
−0.06
IA ID IG* IB PA CA PB IC* PC IE IH PD CB SA MA IF RA II SB* PE MB CC IJ SC RB RC RD
RUG GROUP

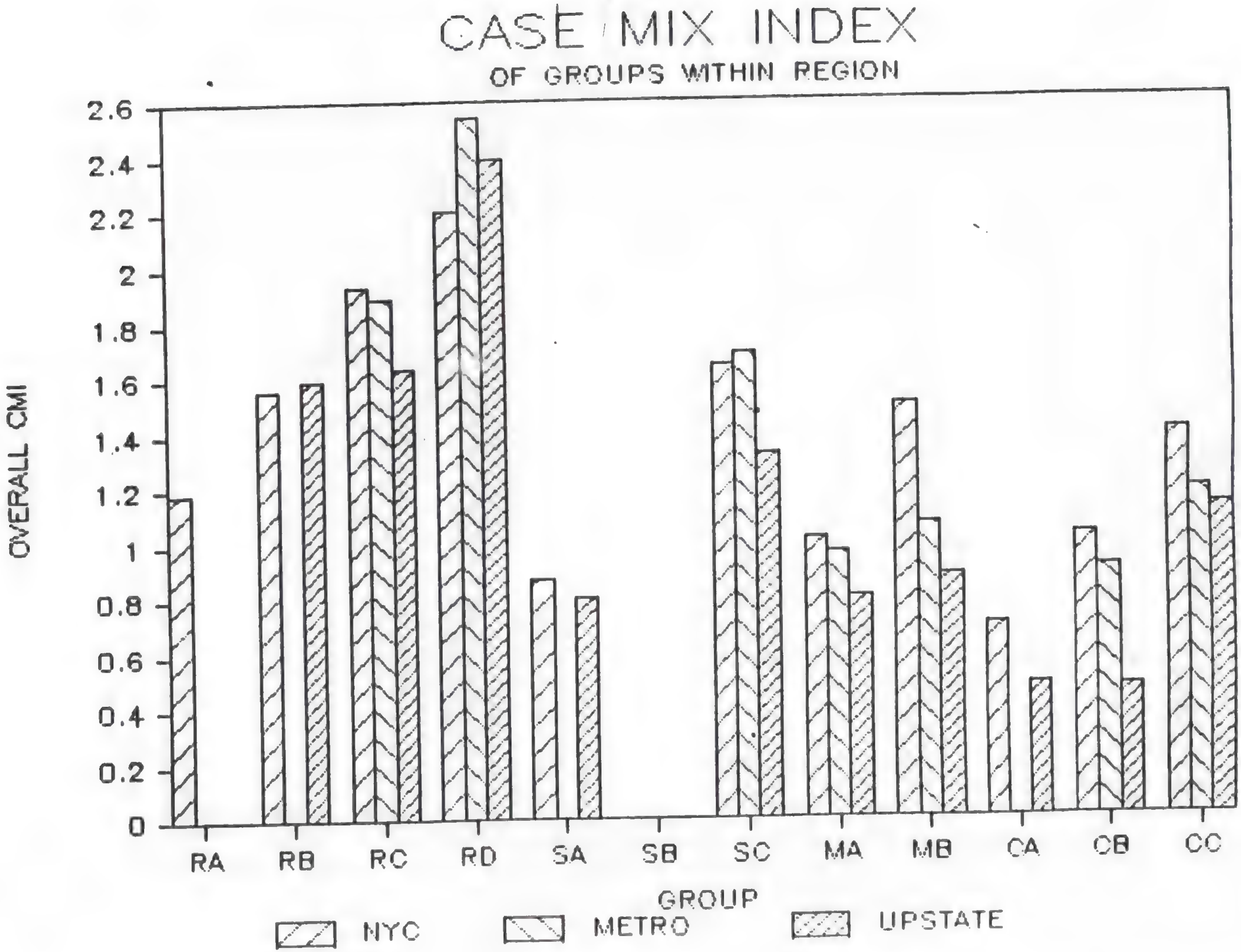

CASE MIX INDEX
OF GROUPS WITHIN REGION
OVERALL CMI
2.6
2.4
2.2
2
1.8
1.6
1.4
1.2
1
0.8
0.6
0.4
0.2
0
RA
RB
RC
RD
SA
SB
SC
MA
MB
CA
CB
CC
GROUP
NYC
METRO
UPSTATE

Figure VII.G

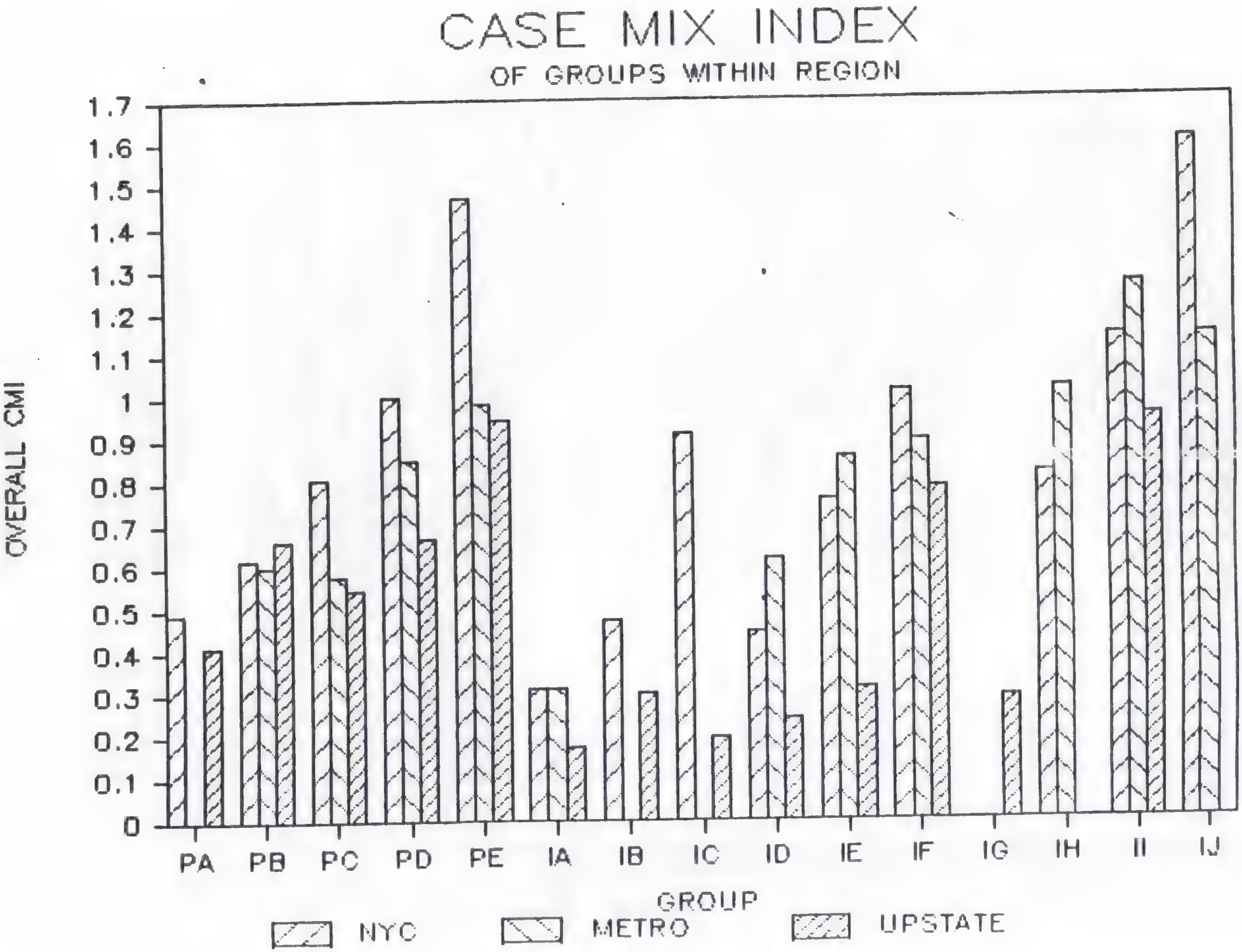


Figure VII.G (cont.)

Table VII.3

NEW YORK CITY - ALL PROGRAMS

GROUP	SIZE	TOTAL COST	CMI	CMI SPECIFIC	RN	LPN	HLTH AIDE	HMKR	PER AIDE	ENV AIDE	PT	OT	ST
					MEAN TIME PER MONTH								
ALL	1278	1101	1.10	1.00	3.49	0.03	14.00	1.14	100.87	5.21	1.32	0.53	0.23
REHAB A	13	1190	1.19	1.08	5.54	0.00	0.00	0.00	24.00	11.08	7.08	2.77	1.85
REHAB B	38	1562	1.56	1.42	2.87	0.00	20.32	0.00	66.21	3.79	7.58	4.00	1.89
REHAB C	36	1939	1.94	1.76	6.08	0.22	22.22	0.00	71.00	3.56	9.33	4.72	2.00
REHAB D	46	2207	2.20	2.00	7.74	0.00	45.30	2.78	61.48	0.00	9.04	5.39	2.26
SPECIAL A	16	870	0.87	0.79	8.31	0.00	9.50	5.00	48.25	0.00	0.25	0.00	0.00
SPECIAL B	5	1226	1.22	1.11	3.20	0.80	8.00	0.80	150.40	0.80	0.00	0.00	0.00
SPECIAL C	36	1646	1.64	1.50	9.33	0.00	22.11	0.00	148.11	0.00	0.56	0.00	0.00
MENT/BEHAV A	54	1017	1.02	0.92	3.48	0.00	23.33	0.00	91.48	2.89	0.56	0.00	0.00
MENT/BEHAV B	168	1498	1.50	1.36	2.20	0.00	13.62	1.33	195.64	0.57	0.49	0.07	0.00
COMPLEX A	16	698	0.70	0.63	7.56	0.00	13.00	0.00	8.00	16.25	0.50	0.00	0.00
COMPLEX B	38	1024	1.02	0.93	7.08	0.00	20.11	0.84	63.79	2.42	0.74	0.00	0.11
COMPLEX C	58	1396	1.39	1.27	7.09	0.00	36.97	0.00	107.38	0.00	0.07	0.14	0.00
PHYSICAL A	20	492	0.49	0.45	7.60	0.00	2.40	0.00	0.00	0.00	0.80	0.40	0.01
PHYSICAL B	50	622	0.62	0.56	7.04	0.40	2.56	2.24	14.56	11.36	0.40	0.00	0.13
PHYSICAL C	31	811	0.81	0.74	5.58	0.00	22.58	1.03	35.36	1.03	1.32	0.00	0.00
PHYSICAL D	167	1002	1.00	0.91	4.11	0.05	19.81	0.31	82.47	0.41	1.22	0.19	0.02
PHYSICAL E	64	1474	1.47	1.34	3.16	0.00	16.81	0.00	175.06	2.19	0.81	0.13	[illegible]
IMPAIRED A	91	315	0.32	0.29	1.02	0.00	1.41	4.26	10.11	23.47	0.25	0.00	[illegible]
IMPAIRED B	69	474	0.47	0.43	0.23	0.00	6.03	2.32	34.90	26.67	0.17	0.01	0.00
IMPAIRED C	12	913	0.91	0.83	5.67	0.00	0.00	0.00	91.33	8.00	0.00	0.00	0.00
IMPAIRED D	17	449	0.45	0.41	0.00	0.00	0.00	4.71	61.18	6.59	0.00	0.00	0.00
IMPAIRED E	66	762	0.76	0.69	0.42	0.00	7.33	1.94	101.82	4.61	0.00	0.00	0.00
IMPAIRED F	76	1014	1.01	0.92	0.55	0.05	1.74	0.47	151.26	3.26	0.12	0.01	0.00
IMPAIRED G	4	492	0.49	0.45	1.00	0.00	0.00	0.00	71.00	0.00	0.00	0.00	0.01
IMPAIRED H	13	820	0.82	0.74	0.69	0.00	0.00	0.00	120.92	0.00	0.62	0.00	0.00
IMPAIRED I	50	1143	1.14	1.04	0.46	0.00	3.38	0.00	173.76	1.92	0.00	0.00	0.00
IMPAIRED J	23	1605	1.60	1.46	0.35	0.00	0.00	0.00	256.35	0.00	0.00	0.00	0.00

Table VII.4

METROPOLITAN REGION - ALL PROGRAMS

GROUP	SIZE	TOTAL COST	CMI	CMI SPECIFIC	RN	LPN	HLTH AIDE	HMKR	PER AIDE	ENV AIDE	PT	OT	ST
					<---- MEAN TIME PER MONTH								---->
ALL	280	1072	1.07	1.00	4.13	0.09	8.74	1.21	98.80	0.19	1.76	0.52	0.29
REHAB A	1	1134	1.13	1.06	8.00	0.00	0.00	0.00	0.00	0.00	4.00	4.00	4.00
REHAB B	3	1717	1.71	1.60	9.33	0.00	29.33	0.00	0.00	0.00	5.33	9.33	1.33
REHAB C	8	1892	1.89	1.76	8.75	0.00	22.50	0.00	74.00	0.00	8.50	3.63	1.00
REHAB D	15	2546	2.54	2.37	6.73	0.00	42.93	0.27	72.80	0.27	14.13	5.60	3.20
SPECIAL A	6	899	0.90	0.84	9.83	0.00	2.00	0.00	58.67	0.00	0.00	0.00	0.00
SPECIAL B	2	1653	1.65	1.54	8.00	12.00	40.00	0.00	0.00	0.00	4.00	0.00	0.00
SPECIAL C	11	1686	1.68	1.57	4.18	0.00	3.64	0.00	224.73	0.00	0.73	0.00	0.00
MENT/BEHAV A	12	967	0.97	0.90	5.17	0.00	15.33	0.00	83.00	0.00	0.67	0.00	0.00
MENT/BEHAV B	35	1071	1.07	1.00	3.23	0.00	10.17	0.00	118.63	0.00	1.26	0.00	0.00
COMPLEX A	2	437	0.44	0.41	4.00	0.00	0.00	0.00	0.00	0.00	4.00	0.00	0.00
COMPLEX B	12	908	0.91	0.85	6.67	0.00	12.33	0.00	62.33	0.00	1.00	0.00	0.00
COMPLEX C	21	1186	1.18	1.11	3.00	0.00	5.33	0.00	151.14	0.00	0.76	0.00	0.00
PHYSICAL A	2	421	0.42	0.39	8.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
PHYSICAL B	9	602	0.60	0.56	9.44	0.00	0.00	8.89	0.00	0.00	0.89	0.00	0.00
PHYSICAL C	9	582	0.58	0.54	3.22	0.00	2.22	1.78	53.33	0.00	0.89	0.00	0.00
PHYSICAL D	40	856	0.85	0.80	6.35	0.00	4.70	3.60	63.60	0.00	1.10	0.00	0.00
PHYSICAL E	15	993	0.99	0.92	3.00	0.00	10.67	0.00	100.53	0.00	0.80	0.00	1.07
IMPAIRED A	10	313	0.31	0.29	0.30	0.00	3.20	8.00	35.20	0.00	0.00	0.00	0.00
IMPAIRED B	1	210	0.21	0.20	4.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
IMPAIRED C	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
IMPAIRED D	7	619	0.62	0.58	1.14	0.00	0.00	2.29	88.00	0.00	0.00	0.00	0.00
IMPAIRED E	20	861	0.86	0.80	0.85	0.00	5.40	0.00	117.60	2.40	0.40	0.00	0.00
IMPAIRED F	12	900	0.90	0.84	1.17	0.00	8.00	0.00	123.33	0.00	0.00	0.00	0.00
IMPAIRED G	1	1788	1.78	1.67	1.00	0.00	0.00	0.00	280.00	0.00	0.00	0.00	0.00
IMPAIRED H	9	1023	1.02	0.95	1.00	0.00	0.00	0.00	156.78	0.00	0.00	0.00	0.00
IMPAIRED I	7	1266	1.26	1.18	1.00	0.00	0.00	0.00	196.00	0.00	0.00	0.00	0.00
IMPAIRED J	10	1144	1.14	1.07	1.00	0.00	0.00	0.00	169.00	0.00	0.80	0.00	0.00

Table VII.5

UPSTATE REGION - ALL PROGRAMS

GROUP	SIZE	TOTAL COST	CMI	CMI SPECIFIC	RN	LPN	HLTH AIDE	HMKR	PEP AIDE	ENV AIDE	PT	OT	ST
					<------	------	------	MEAN TIME PER MONTH	------	------	------	------	------
ALL	722	798	0.80	1.00	5.37	0.23	16.72	2.97	33.96	2.09	1.30	0.34	0.18
REHAB A	6	838	0.84	1.05	2.83	0.00	0.00	2.67	0.00	2.67	8.00	1.33	2.00
REHAB B	9	1593	1.59	2.00	3.89	0.00	12.89	0.00	37.33	0.00	10.67	[illegible]	3.11
REHAB C	12	1639	1.64	2.05	9.67	0.00	13.67	0.00	16.67	0.00	8.00	5.67	1.67
REHAB D	16	2393	2.39	3.00	5.81	0.00	35.00	5.00	63.75	2.25	17.00	3.63	2.25
SPECIAL A	7	807	0.81	1.01	12.00	0.00	5.71	0.00	17.14	0.00	0.29	0.00	0.00
SPECIAL B	6	987	0.99	1.24	6.17	0.00	0.00	0.00	94.00	0.00	0.00	1.33	0.00
SPECIAL C	55	1324	1.32	1.66	9.45	1.45	57.45	0.15	24.00	0.73	0.87	0.15	0.00
MENT/BEHAV A	49	803	0.80	1.01	8.12	0.41	12.00	0.00	32.16	3.43	0.12	0.08	0.16
MENT/BEHAV B	100	876	0.87	1.10	4.10	0.12	23.72	2.40	57.40	2.44	0.52	0.16	0.12
COMPLEX A	11	485	0.48	0.61	4.73	0.00	6.91	1.09	15.27	3.64	0.45	0.36	0.00
COMPLEX B	28	474	0.47	0.59	3.61	0.00	10.00	3.21	18.71	2.86	0.50	0.14	0.00
COMPLEX C	38	1128	1.13	1.41	6.66	0.11	24.11	6.42	68.32	0.00	1.26	0.11	0.11
PHYSICAL A	16	416	0.42	0.52	7.31	0.00	0.00	0.00	0.00	0.00	0.56	0.00	0.00
PHYSICAL B	35	662	0.66	0.83	9.26	0.00	4.69	5.94	5.49	1.37	0.80	0.00	0.11
PHYSICAL C	29	549	0.55	0.69	7.00	0.28	4.69	0.00	12.28	0.00	0.83	0.00	0.00
PHYSICAL D	117	672	0.67	0.84	5.79	0.24	13.78	2.19	24.65	0.38	0.80	0.20	0.00
PHYSICAL E	52	946	0.94	1.19	5.83	0.31	30.69	1.69	33.39	1.77	1.62	0.12	0.15
IMPAIRED A	41	177	0.18	0.22	0.73	0.00	2.05	3.15	5.46	9.76	0.10	0.00	0.01
IMPAIRED B	7	300	0.30	0.38	4.57	0.00	0.00	0.00	1.14	8.57	0.00	0.00	0.00
IMPAIRED C	7	200	0.20	0.25	1.86	0.00	0.00	4.57	12.00	0.00	0.00	0.00	0.00
IMPAIRED D	18	240	0.24	0.30	0.44	0.00	2.67	7.33	23.33	0.22	0.00	0.00	0.00
IMPAIRED E	18	316	0.32	0.40	0.89	0.00	1.78	3.56	37.33	0.00	0.00	0.00	0.00
IMPAIRED F	9	788	0.79	0.99	1.11	0.00	1.78	7.11	105.78	2.22	0.00	0.00	0.00
IMPAIRED G	9	291	0.29	0.36	0.44	0.00	0.00	1.89	40.44	0.89	0.00	0.00	0.00
IMPAIRED H	5	337	0.34	0.42	0.20	0.00	0.00	8.00	43.20	1.60	0.00	0.00	0.00
IMPAIRED I	12	956	0.95	1.20	1.92	0.00	9.33	18.67	94.33	5.00	0.67	0.00	0.00
IMPAIRED J	5	1273	1.27	1.59	0.00	0.00	0.00	0.00	177.60	28.00	0.00	0.00	0.00

- Across virtually all categories, NYC and Metro are more costly than upstate. In the two largest categories, Mental B and Physical D, NYC is significantly more expensive than Metro, while in many other categories, NYC and Metro are fairly close in cost.

- The distribution of patients across the RUG-HHC categories is fairly similar across th state. There are far more Impaired in the NYC sample due to the large number of PC patients from NYC in the sample.

- When the case mix indices of Table VII.2 are applied to the distribution of patients shown on Tables VII.3 to VII.5, the average CMI by region is: NYC - .99, Metro - 1.06, and Upstate - .98. Using the costs in the regions and these average CMIs gives a cost for a CMI of 1.0 for NYC as $1,291, Metro as $1,011, and Upstate as $814. (Note that the same input prices were used in each region; hence, these differences reflect differences in resource use and composition).

VII.E.2 Analysis by type of home care program

Figure VII.H, and Tables VII.6 to VII.8 show the results when each program is separately analyzed. Note that region and informal support are not controlled for in this analysis. Thus, the results must be interpreted cautiously; later in this section program and region are controlled for simultaneously. If a column is not included on a graph, it is due to too few sample points for a meaningful statistics to be computed. Note that the CMIs quoted on these graphs and tables are all program specific and include all patients in the program regardless of informal support system. The results show that each program tends to follow the CMI trends of the overal average. However, there is some variation by type of program as noted below:

- The LTHHCP, with patients concentrated in Mental, Clinical and Physical hierarchies, tends to be equal to or less expensive than the other programs. The largest group, Physical D, is approximately equal in cost to the other programs.

- The PC program with patients across all hierarchy groups but concentrated in Mental, Physical and Impaired hierarchies tends to be the most expensive program across the RUG-HHC groups.

- CHHA patients tend to be found in all groups with the exception of the Impaired. Physical D is the largest CHHA category, and there are also (relatively speaking) large numbers of CHHA patients in the Rehab, Special, and Clinical groups. CHHA costs per category tend to be similar to the LTHHCP in the Physical categories, are near the PC program in the Rehab groups, and between the PC and LTHHCP in the Mental and Clinical groups.

- When the statewide overall CMIs in Table VII.2 are applied to the distribution of cases shown on Tables VII.6 to VII.8, the program specific CMIs are .93 for the PC program, 1.06 for the CHHA, and 1.04 for the LTHHCP. This means the cost for a CMI of 1.0 is

Figure VII.H.

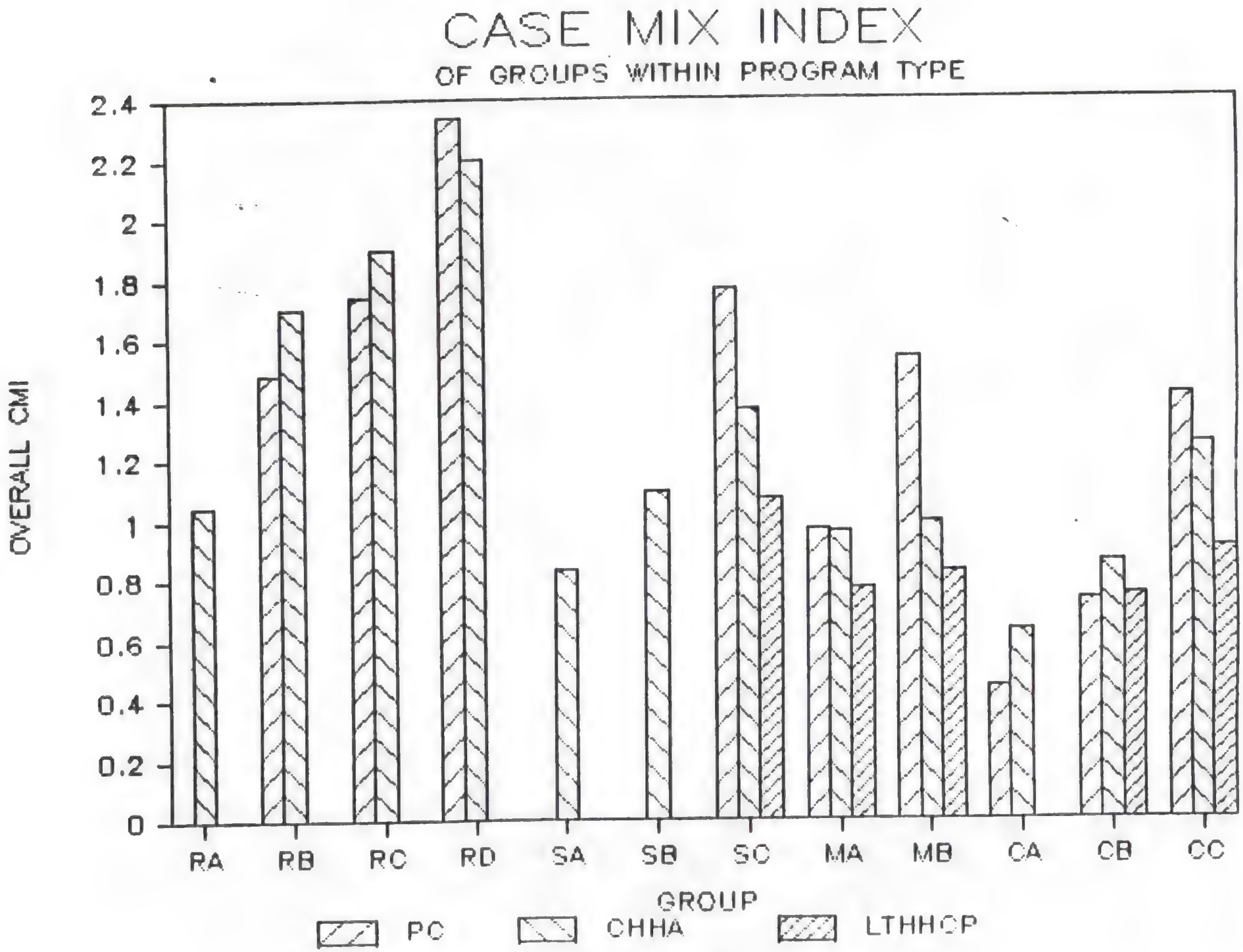

CASE MIX INDEX
OF GROUPS WITHIN PROGRAM TYPE
OVERALL CMI
2.4
2.2
2
1.8
1.6
1.4
1.2
1
0.8
0.6
0.4
0.2
0
RA
RB
RC
RD
SA
SB
SC
MA
MB
CA
CB
CC
GROUP
PC
CHHA
LTHHCP

Figure VII.H. (cont.)

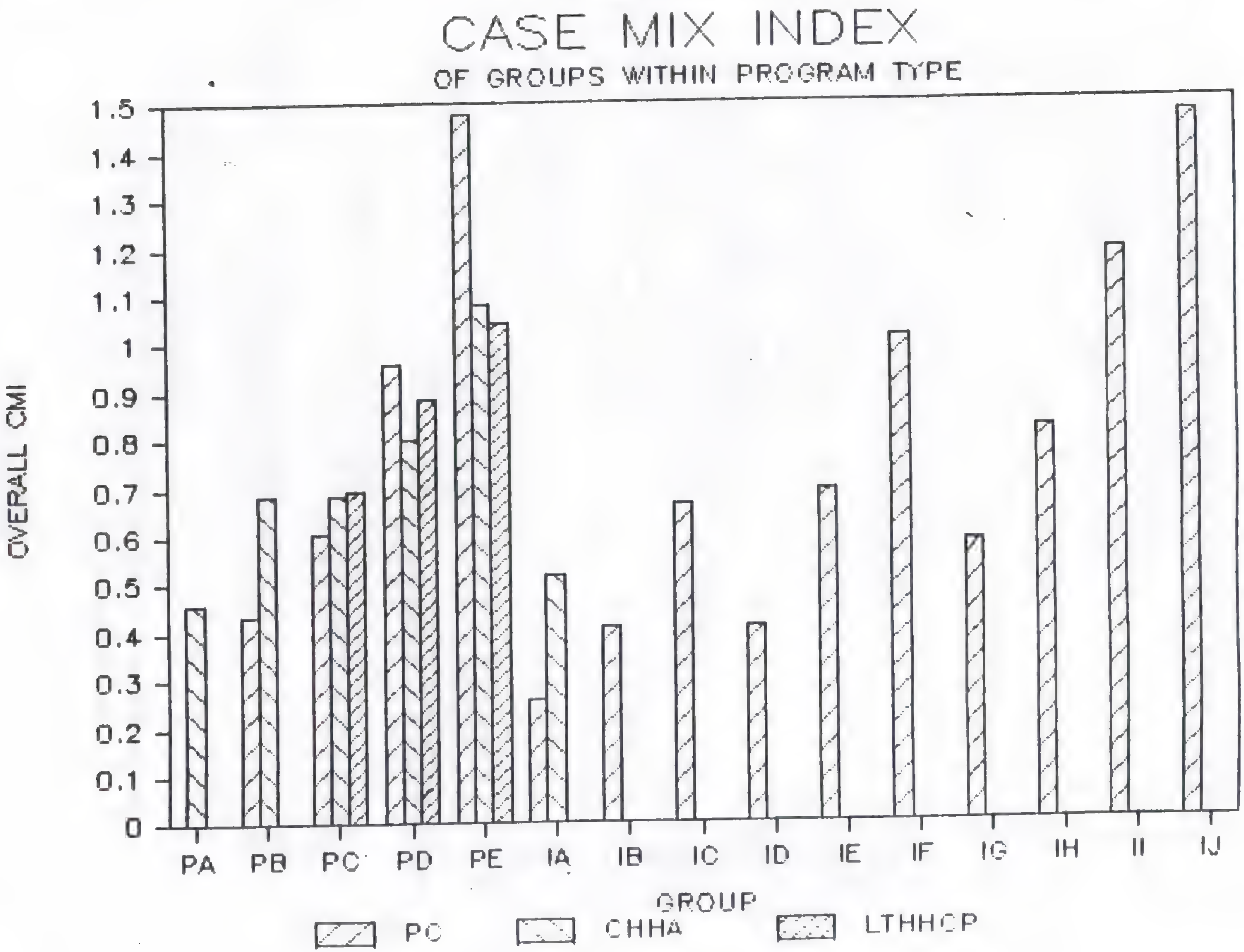


Table VII.6

ALL OF NYS - PERSONAL CARE PROGRAM

GROUP	SIZE	TOTAL COST	CMI	CMI SPECIFIC	RN	LPN	HLTH AIDE	HMKR	PER AIDE	ENV AIDE	PT	OT	ST
					MEAN TIME PER MONTH								
ALL	1028	1009	1.01	1.00	0.53	0.02	0.15	2.28	141.01	6.84	0.47	0.21	0.16
REHAB A	6	1161	1.16	1.15	0.00	0.00	0.00	2.67	38.67	26.67	7.33	2.67	2.67
REHAB B	23	1487	1.48	1.47	0.52	0.00	0.00	0.00	110.61	4.17	5.57	4.00	3.13
REHAB C	14	1752	1.75	1.74	0.00	0.00	0.00	0.00	154.57	9.14	6.29	3.14	3.14
REHAB D	13	2343	2.34	2.32	2.23	0.00	1.54	0.00	189.54	2.77	11.08	3.69	2.77
SPECIAL A	5	818	0.82	0.81	0.20	0.00	0.00	6.40	124.00	0.00	0.00	0.00	0.00
SPECIAL B	5	1317	1.32	1.31	1.60	0.80	0.80	0.80	189.60	0.80	0.00	0.00	0.00
SPECIAL C	26	1771	1.77	1.76	4.69	0.00	0.00	0.00	244.77	1.54	0.00	0.00	0.00
MENT/BEHAV A	41	969	0.97	0.96	0.59	0.00	0.00	0.00	145.17	6.44	0.00	0.00	0.00
MENT/BEHAV B	156	1540	1.54	1.53	0.46	0.00	0.18	2.06	236.95	2.18	0.10	0.05	0.00
COMPLEX A	7	445	0.44	0.44	1.71	0.00	0.00	0.00	29.71	17.14	1.14	0.00	0.00
COMPLEX B	19	731	0.73	0.73	0.53	0.00	0.00	3.58	103.37	6.74	0.00	0.00	0.00
COMPLEX C	44	1420	1.42	1.41	1.34	0.00	1.09	3.64	211.96	0.00	0.09	0.00	0.00
PHYSICAL A	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
PHYSICAL B	13	435	0.43	0.43	1.69	0.00	0.00	0.00	32.62	14.77	0.92	0.00	0.00
PHYSICAL C	8	606	0.60	0.60	0.50	1.00	0.00	4.00	72.00	0.00	1.00	0.00	0.00
PHYSICAL D	64	959	0.96	0.95	0.53	0.00	0.00	2.00	146.50	0.69	0.06	0.06	0.00
PHYSICAL E	44	1479	1.48	1.47	0.68	0.00	0.00	0.00	232.18	0.16	0.09	0.00	0.00
IMPAIRED A	110	259	0.26	0.26	0.07	0.00	0.44	4.15	13.16	23.05	0.03	0.00	0.00
IMPAIRED B	67	409	0.41	0.41	0.00	0.00	0.00	2.39	36.06	27.10	0.06	0.00	0.00
IMPAIRED C	12	664	0.66	0.66	0.00	0.00	0.00	1.33	98.00	8.00	0.00	0.00	0.00
IMPAIRED D	34	408	0.41	0.40	0.12	0.00	0.00	5.76	55.88	3.29	0.00	0.00	0.00
IMPAIRED E	91	696	0.70	0.69	0.22	0.00	0.00	1.93	104.79	3.87	0.00	0.00	0.00
IMPAIRED F	89	1015	1.01	1.01	0.34	0.04	0.04	1.12	156.49	3.01	0.01	0.00	0.00
IMPAIRED G	10	585	0.58	0.58	0.10	0.00	0.00	1.60	92.00	0.00	0.00	0.00	0.00
IMPAIRED H	24	824	0.82	0.82	0.38	0.00	0.00	1.67	126.29	0.00	0.00	0.00	0.00
IMPAIRED I	61	1189	1.19	1.18	0.30	0.00	0.00	3.67	182.16	2.56	0.13	0.00	0.00
IMPAIRED J	36	1477	1.48	1.46	0.50	0.00	0.00	0.00	228.50	3.89	0.22	0.00	0.00

Table VII.7

ALL OF NYS - CHHA PROGRAM

GROUP	SIZE	TOTAL COST	CMI	CMI SPECIFIC	MEAN TIME PER MONTH: RN	LPN	HLTH AIDE	HMKR	PER AIDE	ENV AIDE	PT	OT	ST
ALL	883	1038	1.04	1.00	9.27	0.14	25.45	0.95	14.23	0.93	2.45	0.79	[illegible]
REHAB A	14	1047	1.05	1.01	6.93	0.00	0.00	0.00	5.71	0.00	7.14	[illegible]	1.71
REHAB B	22	1708	1.71	1.65	7.09	[illegible]	41.82	0.00	0.73	0.00	10.73	4.55	[illegible]
REHAB C	38	1903	1.90	1.83	10.05	[illegible]	22.74	0.00	29.05	0.00	10.11	5.39	1.16
REHAB D	55	2203	2.20	2.12	9.16	0.00	53.24	2.33	18.98	0.00	10.55	5.56	2.55
SPECIAL A	19	841	0.84	0.81	11.16	0.00	10.74	0.00	21.90	0.00	[illegible]	0.00	0.00
SPECIAL B	7	1098	1.10	1.06	8.57	3.43	16.57	0.00	40.00	0.00	1.14	0.00	0.00
SPECIAL C	62	1371	1.37	1.32	11.85	0.26	55.55	0.00	25.61	0.00	0.84	0.13	0.00
MENT/BEHAV A	45	965	0.96	0.93	12.38	0.44	21.96	0.00	7.64	0.00	0.67	0.00	0.00
MENT/BEHAV B	78	997	1.00	0.96	8.71	0.05	40.46	0.00	8.92	0.00	1.59	0.05	0.15
COMPLEX A	18	635	0.63	0.61	8.89	0.00	7.11	0.00	2.22	10.00	0.44	0.00	0.00
COMPLEX B	49	859	0.86	0.83	8.73	0.00	20.65	0.08	[illegible]	0.90	0.94	0.08	0.08
COMPLEX C	56	1253	1.25	1.21	10.95	0.07	52.90	1.45	18.41	0.00	0.90	0.07	0.00
PHYSICAL A	38	456	0.46	0.44	7.50	0.00	1.26	0.00	0.00	0.00	0.66	0.21	0.00
PHYSICAL B	74	683	0.68	0.66	9.80	0.27	2.11	5.41	3.95	5.30	0.59	0.00	[illegible]
PHYSICAL C	42	685	0.68	0.66	8.76	0.00	13.24	0.38	3.81	0.76	1.24	0.00	0.00
PHYSICAL D	163	803	0.80	0.77	8.50	0.05	16.88	1.25	14.16	0.22	1.63	0.10	0.00
PHYSICAL E	57	1083	1.08	1.04	8.12	0.28	26.91	0.00	34.88	2.46	1.96	0.18	[illegible]
IMPAIRED A	15	517	0.52	0.50	7.73	0.00	5.33	0.00	0.00	0.00	1.07	0.00	0.00
IMPAIRED B-	5	745	0.74	0.72	9.60	0.00	16.00	0.00	0.00	0.00	1.60	0.00	0.00
IMPAIRED C	6	714	0.71	0.69	13.50	0.00	0.00	0.00	0.67	0.00	0.00	0.00	0.00
IMPAIRED D	3	348	0.35	0.34	2.67	0.00	16.00	0.00	9.33	0.00	0.00	0.00	[illegible]
IMPAIRED E	4	818	0.82	0.79	8.25	0.00	37.00	0.00	6.00	0.00	0.00	0.00	[illegible]
IMPAIRED F	5	667	0.67	0.64	6.40	0.00	25.60	0.00	0.00	0.00	1.60	0.00	0.00
IMPAIRED G	2	210	0.21	0.20	4.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	[illegible]
IMPAIRED H	1	873	0.87	0.84	6.00	0.00	0.00	0.00	0.00	0.00	8.00	0.00	0.00
IMPAIRED I	3	350	0.35	0.34	6.67	0.00	0.00	0.00	0.00	0.00	0.00	0.00	[illegible]
IMPAIRED J	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Table VII.8

ALL OF NYS - LTHHCP PROGRAM

GROUP	SIZE	TOTAL COST	CMI	CMI SPECIFIC	RN	LPN	HLTH AIDE	HMKR	PER AIDE	ENV AIDE	PT	OT	ST
					<---------- MEAN TIME PER MONTH								----------
ALL	291	922	0.92	1.00	2.13	0.00	24.23	1.95	73.75	0.88	1.18	0.52	0.12
REHAB A	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
REHAB B	4	1483	1.48	1.61	0.75	0.00	14.00	0.00	58.00	12.00	8.00	5.00	2.00
REHAB C	4	1935	1.93	2.10	5.75	0.00	70.00	0.00	20.00	0.00	7.00	4.50	3.00
REHAB D	6	2430	2,43	2.64	2.17	0.00	56.67	14.00	85.33	0.67	12.00	6.00	2.00
SPECIAL A	4	488	0.49	0.53	1.75	0.00	0.00	12.00	52.00	0.00	0.00	0.00	0.00
SPECIAL B	1	1084	1.08	1.18	1.00	0.00	0.00	0.00	88.00	0.00	0.00	8.00	0.00
SPECIAL C	12	1070	1.07	1.16	3.42	0.00	18.00	0.67	97.67	0.00	2.00	0.00	0.00
MENT/BEHAV A	24	771	0.77	0.84	2.50	0.00	28.83	0.00	48.50	2.50	0.58	0.17	0.17
MENT/BEHAV B	57	825	0.82	0.89	2.14	0.00	19.65	2.46	74.88	0.00	0.58	0.28	0.00
COMPLEX A	4	708	0.71	0.77	2.25	0.00	39.00	3.00	12.00	0.00	1.25	1.00	0.00
COMPLEX B	9	750	0.75	0.81	1.33	0.00	16.00	5.56	72.00	0.00	0.89	0.00	0.00
COMPLEX C	15	907	0.91	0.98	2.20	0.00	3.73	0.00	106.93	0.00	0.80	0.53	0.27
PHYSICAL A	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
PHYSICAL B	6	524	0.52	0.57	2.00	0.00	18.67	0.00	34.00	5.33	0.00	0.00	0.00
PHYSICAL C	18	696	0.70	0.76	1.83	0.00	16.67	0.00	65.11	0.00	0.72	0.00	0.00
PHYSICAL D	92	888	0.89	0.96	2.08	0.00	22.48	1.30	79.26	0.35	0.75	0.37	0.04
PHYSICAL E	23	1045	1.04	1.13	1.87	0.00	25.74	2.43	96.87	0.00	1.04	0.17	0.35
IMPAIRED A	2	776	0.77	0.84	0.50	0.00	40.00	24.00	0.00	0.00	4.00	0.00	0.00
IMPAIRED B	3	1285	1.28	1.39	1.33	0.00	112.00	0.00	0.00	26.67	0.00	0.00	0.00
IMPAIRED C	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
IMPAIRED D	2	551	0.55	0.60	2.00	0.00	0.00	0.00	72.00	0.00	0.00	0.00	0.00
IMPAIRED E	2	1918	1.91	2.08	3.00	0.00	168.00	0.00	30.00	0.00	0.00	0.00	0.00
IMPAIRED F	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
IMPAIRED G	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
IMPAIRED H	1	746	0.74	0.81	1.00	0.00	0.00	0.00	112.00	0.00	0.00	0.00	0.00
IMPAIRED I	1	1627	1.62	1.76	1.00	0.00	168.00	0.00	0.00	0.00	0.00	0.00	0.00
IMPAIRED J	1	1387	1.38	1.50	0.00	0.00	0.00	0.00	224.00	0.00	0.00	0.00	0.00

$1,085 for the PC program, $979 for the CHHA, and $886 for the LTHHCP.

VII.E.3 Informal support system analysis

Figures VII.I and VII.J and Tables VII.9 and VII.10 show the results found by controlling for inforal support availability (ISS) measured in terms of its absence or presence. Neither program or region are controlled in these tables. The major results are as follows:

- Across virtually all categories, the cost for patients without ISS is 10-20% higher than the cost for patients with an ISS.

- The two largest groups are Mental B and Physical D regardless of the ISS status. In both groups, the number of patients with an ISS is much larger than those without. The Mental B group has a CMI of 1.70 for those with no ISS versus 1.19 for those with an ISS.

- When the case mix indices of Table VII.2 are applied to the distribution of patients on Tables VII.9 and VII.10, the average CMI of patients with no ISS is .99, and for patients with an ISS the average CMI is 1.02. Using the costs on Tables VIII.10 and VII.11 and these average CMIs gives a cost for a CMI of 1.0 for patients with no ISS $1,158 for patients with an ISS, the cost for a CMI of 1.0 is $969.

The duration of need for ISS participation in the care of a patient is often raised as a factor in the ISS willingness and the amount of participation in a care plan. For short duration, the ISS has a greater willingness and a high level of reliance can be planned on. As the duration increases, the ISS is less willing and becomes less involved.

Figure VII.K and Tables VII.11 to VII.15 show the results of analyzing patients as a function of duration of the condition. Small sample sizes in many of the groups should be noted before drawing specific conclusions. The general results are as follows:

- There do not appear to be any strong patterns in the cost in each group as a function of duration. The possible exception is the Impaired groups, but the sample sizes for under 12 months are quite small.

- Long duration conditions comprise a very high percentage of the Impaired groups and the Mental B group. The "health services" groups (Rehab, Special, Clinical and Physical) tend to have few long duration patients.

- Table VII.14 shows that 942 of the 2,280 patients in the sample have had the condition for over 5 years.

VII.E.4 Stratifying on Program and ISS in NYC

Tables VII.16 to VII.19 stratify on program, region, and ISS. When the sample is stratified by 3 variables plus the case mix groups, the

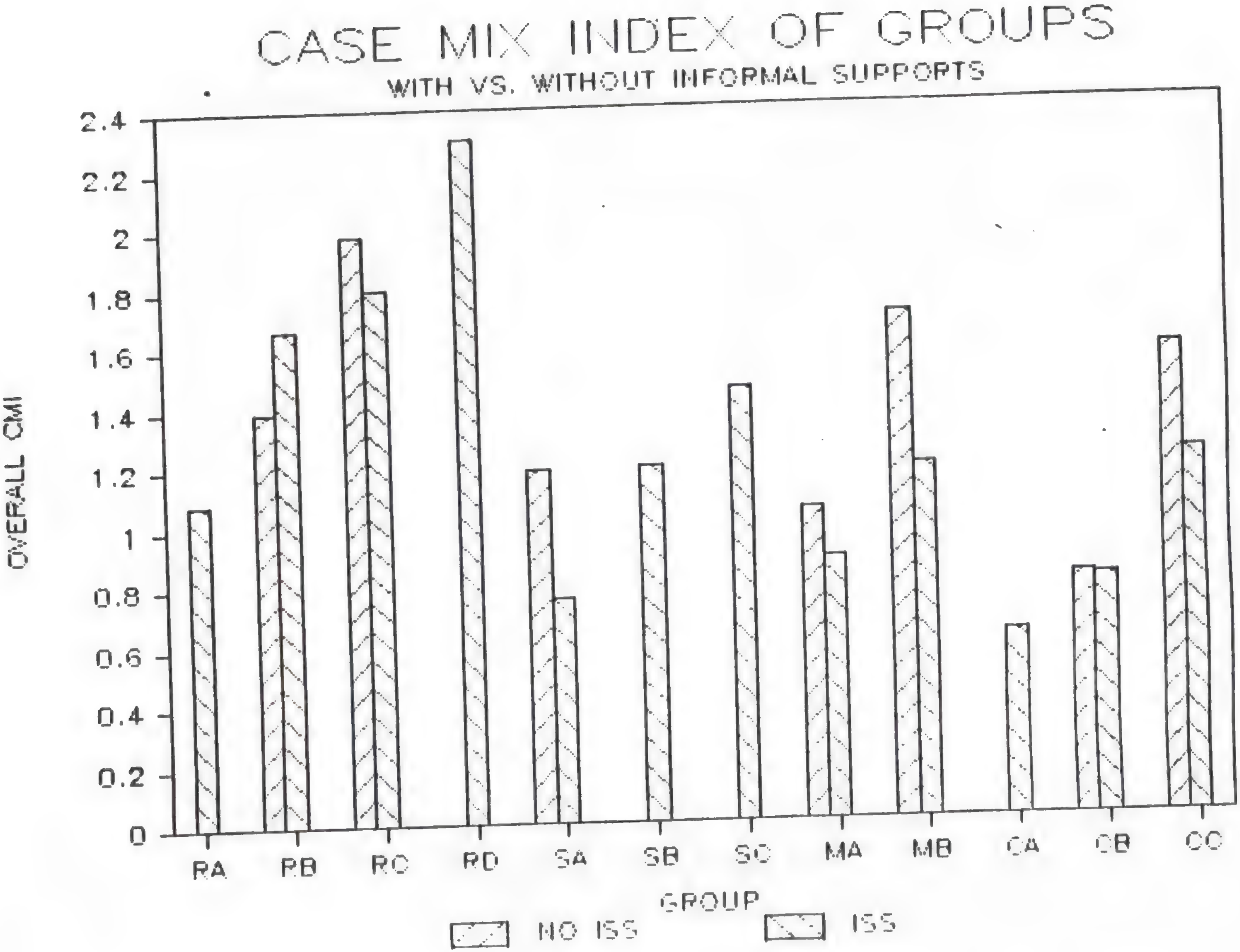

CASE MIX INDEX OF GROUPS
WITH VS. WITHOUT INFORMAL SUPPORTS
OVERALL CMI
2.4
2.2
2
1.8
1.6
1.4
1.2
1
0.8
0.6
0.4
0.2
0
RA
RB
RC
RD
SA
SB
SC
MA
MB
CA
CB
CC
GROUP
NO ISS
ISS

Figure VII.I

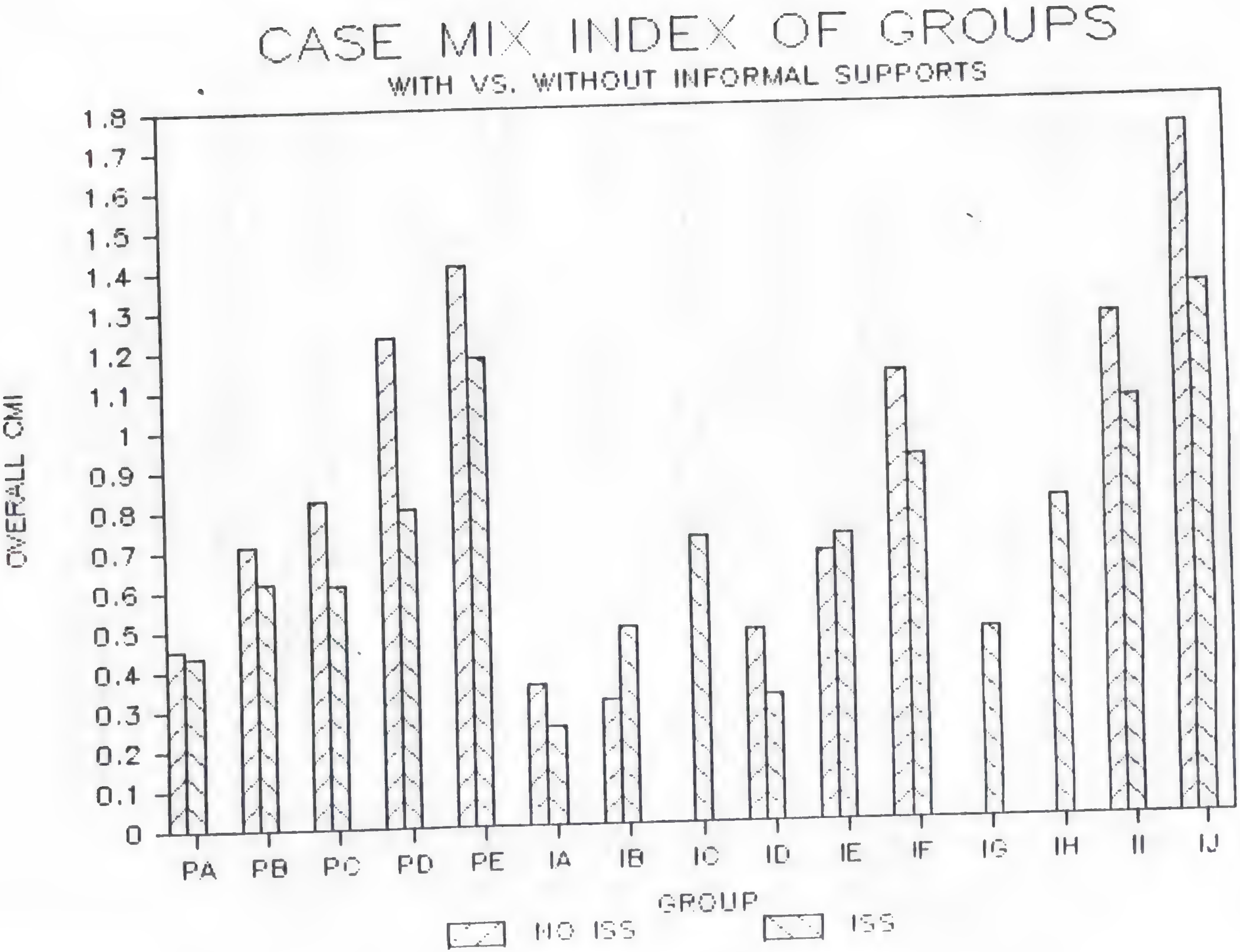


Figure VII.I (cont'd)

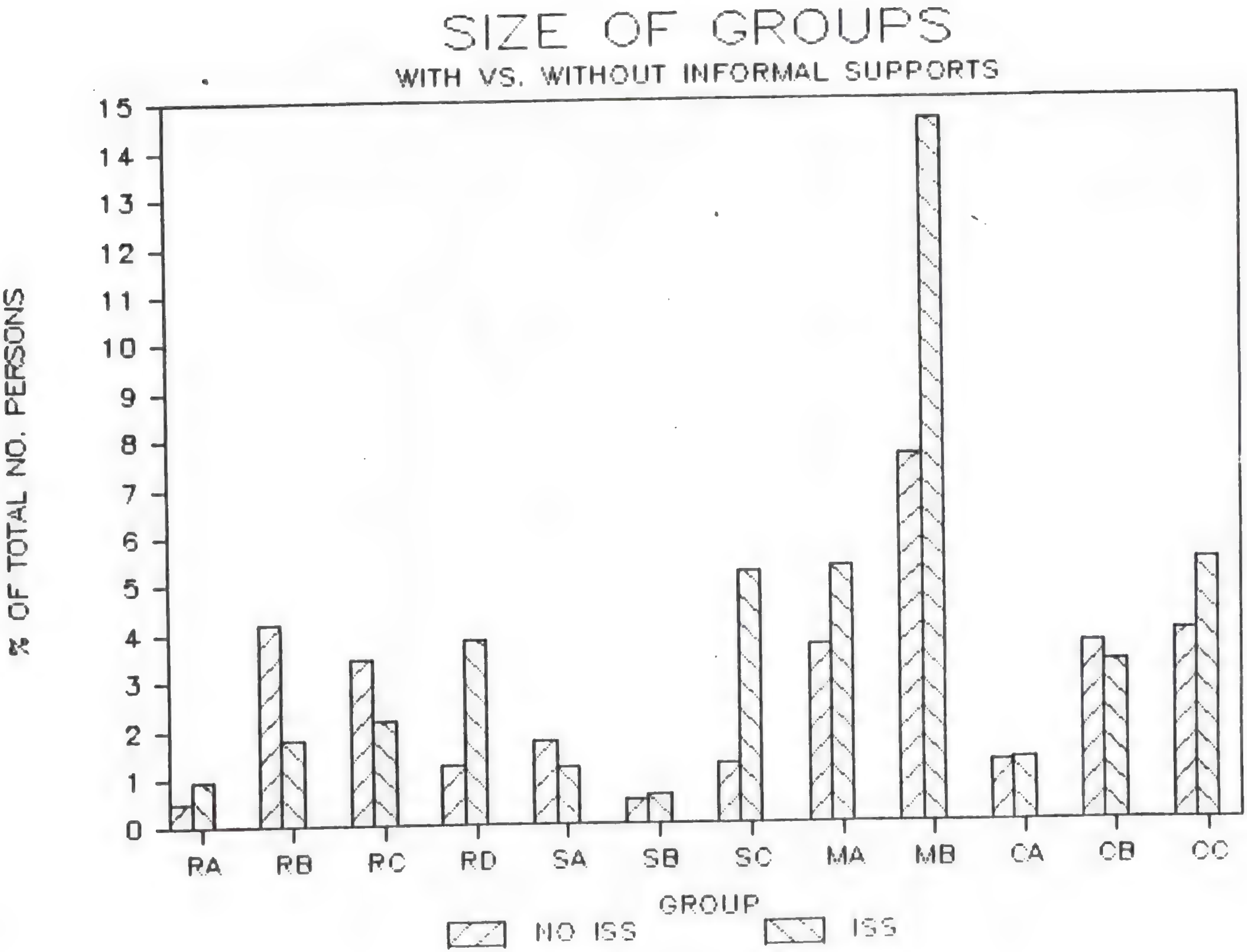

SIZE OF GROUPS
WITH VS. WITHOUT INFORMAL SUPPORTS
% OF TOTAL NO. PERSONS
0
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
RA
RB
RC
RD
SA
SB
SC
MA
MB
CA
CB
CC
GROUP
NO ISS
ISS

Figure VII.J.

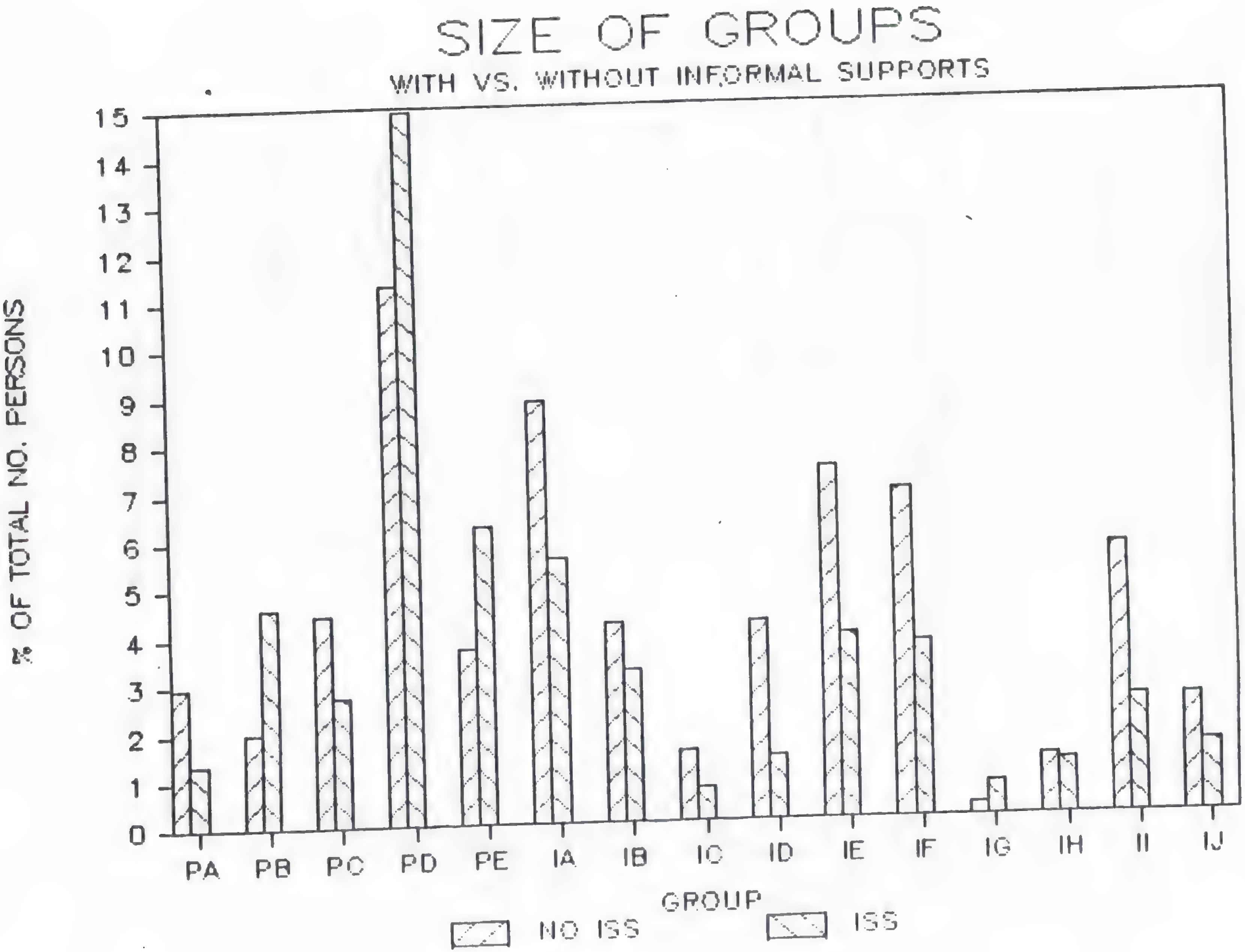


Figure VII.J (cont.)

Table VII.9

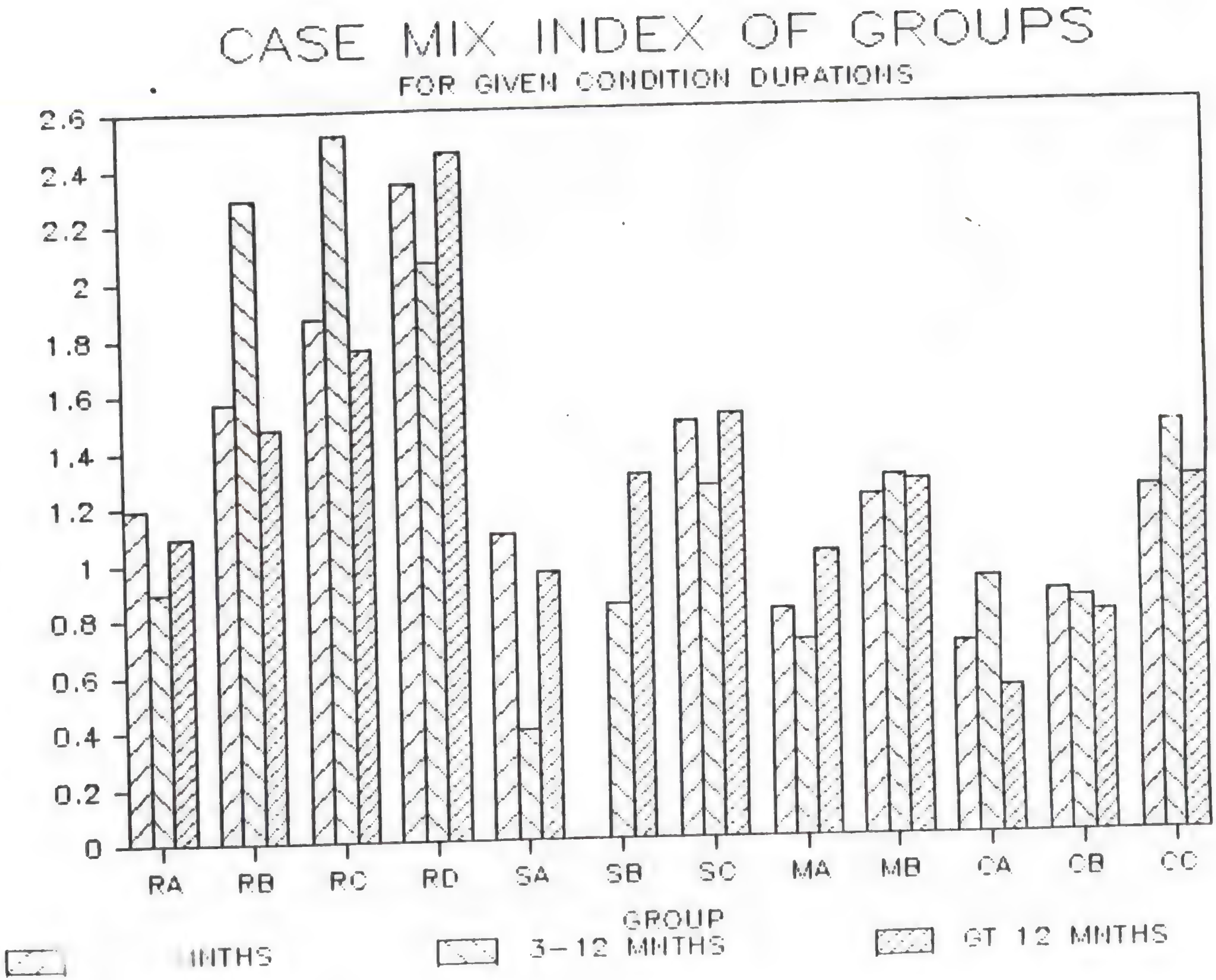
ALL OF NYS - NO INFORMAL SUPPORTS

GROUP	SIZE	TOTAL COST	CMI	CMI SPECIFIC	RN	LPN	HLTH AIDE	HMKR	PER AIDE	ENV AIDE	PT	OT	ST
					<----------			MEAN TIME PER MONTH					---------->
ALL	407	1054	1.05	1.00	2.54	0.05	8.90	1.50	112.04	5.53	0.98	0.41	0.29
REHAB A	2	1011	1.01	0.96	0.00	0.00	0.00	0.00	0.00	48.00	4.00	4.00	4.00
REHAB B	17	1393	1.39	1.32	2.82	0.00	17.65	0.00	38.35	8.47	6.35	4.47	2.59
REHAB C	14	1981	1.98	1.88	2.57	0.00	13.14	0.00	148.86	6.85	5.71	4.00	3.14
REHAB D	5	2427	2.42	2.30	3.20	0.00	67.20	0.00	134.40	0.00	7.20	4.00	2.40
SPECIAL A	7	1189	1.19	1.13	10.29	0.00	11.43	0.00	87.43	0.00	0.00	0.00	0.00
SPECIAL B	2	1108	1.11	1.05	2.00	2.00	2.00	2.00	138.00	2.00	0.00	0.00	0.00
SPECIAL C	5	1802	1.80	1.71	2.80	0.00	67.20	0.00	150.40	0.00	0.80	0.80	0.00
MENT/BEHAV A	15	1048	1.05	0.99	5.20	0.00	0.00	0.00	124.53	0.00	0.67	0.00	0.00
MENT/BEHAV B	31	1700	1.70	1.61	1.48	0.00	12.77	0.00	228.58	1.55	0.00	0.00	0.26
COMPLEX A	5	460	0.46	0.44	4.20	0.00	16.00	0.00	0.00	14.40	0.00	0.00	0.00
COMPLEX B	15	810	0.81	0.77	3.20	0.00	9.07	2.53	81.33	6.13	0.00	0.00	0.00
COMPLEX C	16	1578	1.58	1.50	2.75	0.25	14.00	0.00	203.63	0.00	0.50	0.00	0.00
PHYSICAL A	12	455	0.45	0.43	6.42	0.00	4.00	0.00	0.00	0.00	1.42	0.00	0.00
PHYSICAL B	8	714	0.71	0.68	4.63	1.50	16.00	10.00	0.00	20.00	1.00	0.00	0.00
PHYSICAL C	18	829	0.83	0.79	7.67	0.00	18.00	0.00	27.11	0.00	1.56	0.00	0.00
PHYSICAL D	46	1232	1.23	1.17	4.37	0.00	12.43	0.09	132.44	0.09	0.96	0.09	0.09
PHYSICAL E	15	1412	1.41	1.34	1.20	0.00	1.33	0.00	203.73	0.00	1.33	0.00	0.00
IMPAIRED A	36	355	0.35	0.34	2.03	0.00	4.44	3.25	8.89	18.22	0.33	0.00	0.00
IMPAIRED B	17	312	0.31	0.30	0.24	0.00	0.00	0.00	26.35	22.12	0.00	0.00	0.00
IMPAIRED C	6	493	0.49	0.47	0.67	0.00	0.00	2.67	60.67	10.67	0.00	0.00	0.00
IMPAIRED D	17	483	0.48	0.46	0.35	0.00	2.82	3.53	60.47	6.82	0.00	0.00	0.00
IMPAIRED E	30	678	0.68	0.64	0.33	0.00	2.67	0.27	94.13	5.87	0.27	0.00	0.00
IMPAIRED F	28	1129	1.13	1.07	0.71	0.00	0.00	0.00	174.57	1.71	0.00	0.00	0.00
IMPAIRED G	1	149	0.15	0.14	0.00	0.00	0.00	0.00	24.00	0.00	0.00	0.00	0.00
IMPAIRED H	5	714	0.71	0.68	0.20	0.00	0.00	0.00	113.60	0.00	0.00	0.00	0.00
IMPAIRED I	23	1264	1.26	1.20	0.48	0.00	7.30	9.74	175.13	4.17	0.00	0.00	0.00
IMPAIRED J	10	1733	1.73	1.64	0.50	0.00	0.00	0.00	268.40	0.00	0.80	0.00	0.00

Table VII.10

ALL OF NYS - WITH INFORMAL SUPPORTS

GROUP	SIZE	TOTAL COST	CMI	CMI SPECIFIC	RN	LPN	HLTH AIDE	HMKR	PER AIDE	ENV AIDE	PT	OT	ST
					<-------------------------			MEAN TIME PER MONTH					------------------------->
ALL	1863	989	0.99	1.00	4.53	0.12	15.45	1.79	71.90	3.17	1.46	0.45	[illegible]
REHAB A	18	1089	1.09	1.10	5.33	0.00	0.00	0.89	17.33	3.56	7.56	2.22	1.75
REHAB B	33	1672	1.67	1.69	3.76	0.00	20.48	0.00	66.67	0.00	8.85	4.24	1.62
REHAB C	41	1802	1.80	1.82	8.90	0.20	23.41	0.00	22.63	0.78	9.95	5.15	1.37
REHAB D	72	2304	2.30	2.33	7.42	0.00	41.00	2.94	59.28	0.56	12.00	5.14	2.44
SPECIAL A	22	756	0.75	0.76	9.27	0.00	5.64	3.64	28.73	0.00	0.27	0.00	[illegible]
SPECIAL B	11	1195	1.19	1.21	5.91	2.18	10.55	0.00	94.55	0.00	0.73	0.73	[illegible]
SPECIAL C	97	1460	1.46	1.48	9.15	0.82	37.73	0.08	86.31	0.41	0.74	0.04	[illegible]
MENT/BEHAV A	99	885	0.88	0.90	5.75	0.20	20.53	0.00	53.01	3.27	0.43	0.04	0.05
MENT/BEHAV B	272	1191	1.19	1.20	3.11	0.04	16.99	1.71	130.02	1.07	0.65	0.10	[illegible]
COMPLEX A	24	628	0.63	0.64	6.67	0.00	8.50	0.50	12.33	9.50	0.88	0.17	[illegible]
COMPLEX B	62	803	0.80	0.81	6.35	0.00	17.03	1.35	38.13	1.29	0.87	0.05	0.06
COMPLEX C	101	1223	1.22	1.24	6.76	0.00	29.19	2.42	86.54	0.00	0.59	0.11	[illegible]
PHYSICAL A	25	440	0.44	0.45	8.00	0.00	0.00	0.00	0.00	0.00	0.00	0.32	[illegible]
PHYSICAL B	85	619	0.62	0.63	8.47	0.09	1.93	3.76	8.71	5.38	0.56	[illegible]	[illegible]
PHYSICAL C	51	616	0.62	0.62	5.24	0.16	10.43	0.94	28.31	0.63	0.88	0.00	0.00
PHYSICAL D	278	804	0.80	0.81	5.10	0.13	16.22	1.61	47.15	0.39	1.08	0.18	[illegible]
PHYSICAL E	116	1183	1.18	1.20	4.59	0.14	24.24	0.76	98.21	2.00	1.10	0.12	[illegible]
IMPAIRED A	104	249	0.25	0.25	0.51	0.00	0.81	4.61	11.31	17.38	0.14	0.00	[illegible]
IMPAIRED B	60	495	0.49	0.50	0.80	0.00	6.93	2.67	32.80	25.40	0.20	[illegible]	[illegible]
IMPAIRED C	13	723	0.72	0.73	5.92	0.00	0.00	1.23	62.77	2.46	0.00	0.00	[illegible]
IMPAIRED D	25	322	0.32	0.33	0.40	0.00	0.00	6.72	41.92	0.00	0.00	[illegible]	[illegible]
IMPAIRED E	73	723	0.72	0.73	0.70	0.00	7.45	2.52	94.58	2.41	0.00	[illegible]	0.00
IMPAIRED F	69	918	0.92	0.93	0.67	0.06	3.54	1.45	131.01	3.19	0.13	0.00	[illegible]
IMPAIRED G	13	479	0.48	0.48	0.69	0.00	0.00	1.31	69.54	0.62	0.00	[illegible]	[illegible]
IMPAIRED H	21	807	0.81	0.82	0.81	0.00	0.00	1.90	117.67	0.38	0.38	0.00	[illegible]
IMPAIRED I	46	1053	1.05	1.06	0.91	0.00	2.43	0.00	155.74	1.30	0.17	[illegible]	[illegible]
IMPAIRED J	28	1335	1.33	1.35	0.46	0.00	0.00	0.00	206.79	5.00	0.00	0.00	[illegible]


CASE MIX INDEX OF GROUPS
FOR GIVEN CONDITION DURATIONS
OVERALL CMI
2.6
2.4
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2
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GROUP
MNTHS
3-12 MNTHS
GT 12 MNTHS

Figure VII.K.

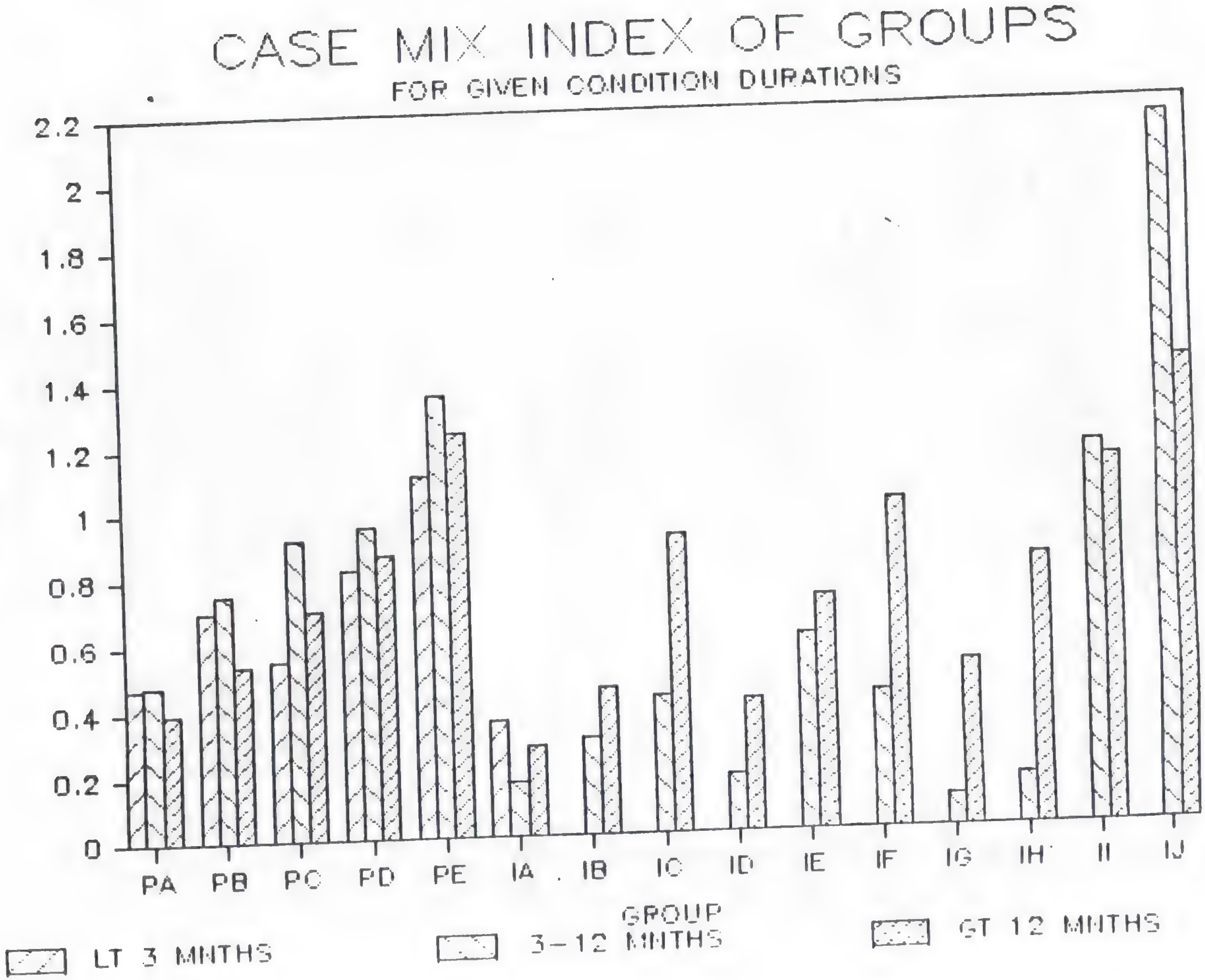


Figure VII.K (cont)

Table VII.11

ALL OF NYS - PRIMARY CONDITION DURATION LESS THAN 3 MONTHS

GROUP	SIZE	TOTAL COST	CMI	CMI SPECIFIC	RN	LPN	HLTH AIDE	HMKR	PER AIDE	ENV AIDE	PT	OT	ST
					<------- MEAN TIME PER MONTH								-------
ALL	470	1042	1.04	1.00	9.24	0.23	18.16	1.86	22.31	0.53	2.67	0.73	0.41
REHAB A	7	1195	1.19	1.15	8.71	0.00	0.00	0.00	11.43	0.00	6.86	2.86	1.71
REHAB B	15	1573	1.57	1.51	6.47	0.00	26.67	0.00	5.60	0.00	9.87	4.53	1.87
REHAB C	19	1866	1.86	1.79	10.53	0.42	29.26	0.00	22.74	0.00	8.00	5.26	1.68
REHAB D	29	2348	2.34	2.25	9.66	0.00	42.62	4.41	28.14	1.24	14.34	4.14	2.76
SPECIAL A	9	1097	1.10	1.05	13.78	0.00	11.11	0.00	37.33	0.00	0.67	0.00	0.00
SPECIAL B	3	954	0.95	0.92	8.00	8.00	12.00	0.00	0.00	0.00	0.00	0.00	0.00
SPECIAL C	27	1487	1.48	1.43	12.30	2.37	21.93	0.00	67.41	0.00	1.48	0.15	0.00
MENT/BEHAV A	22	815	0.81	0.78	10.64	0.00	11.45	0.00	18.18	0.00	0.64	0.00	0.00
MENT/BEHAV B	35	1214	1.21	1.16	9.46	0.00	45.60	0.00	26.63	0.00	1.83	0.11	0.23
COMPLEX A	12	686	0.69	0.66	9.00	0.00	13.00	1.00	1.33	0.00	1.00	0.33	0.00
COMPLEX B	25	861	0.86	0.83	7.64	0.00	14.72	1.44	37.92	0.00	1.20	0.16	0.00
COMPLEX C	21	1231	1.23	1.18	13.90	0.00	23.81	4.00	17.91	0.00	2.10	0.19	0.19
PHYSICAL A	19	473	0.47	0.45	8.00	0.00	0.00	0.00	0.00	0.00	0.47	0.42	0.00
PHYSICAL B	41	703	0.70	0.67	10.37	0.20	2.63	7.02	0.59	3.12	0.68	0.00	0.29
PHYSICAL C	27	551	0.55	0.53	7.11	0.00	7.85	0.59	6.82	0.00	1.04	0.00	0.00
PHYSICAL D	94	821	0.82	0.79	9.07	0.04	12.55	2.13	20.04	0.00	1.44	0.10	0.00
PHYSICAL E	39	1105	1.10	1.06	8.38	0.00	24.00	0.00	48.41	2.15	1.79	0.00	0.41
IMPAIRED A	9	354	0.35	0.34	3.56	0.00	8.89	0.00	1.33	0.00	1.33	0.00	0.00
IMPAIRED B	4	476	0.46	0.46	9.00	0.00	0.00	0.00	0.00	0.50	0.00	0.00	0.00
IMPAIRED C	4	177	0.18	0.17	3.25	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00
IMPAIRED D	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
IMPAIRED E	4	842	0.84	0.81	8.00	0.00	37.00	12.00	0.00	0.00	0.00	0.00	0.00
IMPAIRED F	3	617	0.62	0.59	1.33	0.00	26.67	21.33	26.67	0.00	0.00	0.00	0.00
IMPAIRED G	1	210	0.21	0.20	4.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
IMPAIRED H	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
IMPAIRED I	1	1040	1.04	1.00	0.00	0.00	0.00	0.00	168.00	0.00	0.00	0.00	0.00
IMPAIRED J	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Table VII.12

ALL OF NYS - PRIMARY CONDITION DURATION 3 TO 6 MONTHS

GROUP	SIZE	TOTAL COST	CMI	CMI SPECIFIC	<---------- MEAN TIME PER MONTH ---------- RN	LPN	HLTH AIDE	HMKR	PER AIDE	ENV AIDE	PT	OT	ST
ALL	108	1029	1.03	1.00	7.57	0.07	15.74	3.33	30.78	1.41	3.00	1.26	0.22
REHAB A	2	907	0.91	0.88	4.00	0.00	0.00	0.00	0.00	0.00	6.00	2.00	2.00
REHAB B	4	2160	2.16	2.10	10.00	0.00	69.00	0.00	0.00	0.00	11.00	6.00	0.00
REHAB C	4	3011	3.01	2.93	12.00	0.00	32.00	0.00	0.00	0.00	26.00	10.00	0.00
REHAB D	9	2017	2.01	1.96	11.11	0.00	35.56	8.89	0.00	0.00	8.89	7.11	1.78
SPECIAL A	2	254	0.25	0.25	2.00	0.00	0.00	24.00	0.00	0.00	0.00	0.00	0.00
SPECIAL B	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
SPECIAL C	7	1178	1.18	1.14	6.71	0.57	48.57	0.00	54.86	0.00	0.00	0.00	0.00
MENT/BEHAV A	10	475	0.48	0.46	5.60	0.40	13.60	0.00	2.40	3.20	0.00	0.00	0.00
MENT/BEHAV B	3	1303	1.30	1.27	16.00	0.00	0.00	0.00	74.67	0.00	0.00	0.00	0.00
COMPLEX A	1	878	0.88	0.85	12.00	0.00	0.00	0.00	40.00	0.00	0.00	0.00	0.00
COMPLEX B	11	732	0.73	0.71	7.91	0.00	11.64	4.36	25.46	0.00	0.00	0.00	0.25
COMPLEX C	11	765	0.75	0.76	4.64	0.00	0.00	7.27	66.91	0.00	1.45	0.00	0.00
PHYSICAL A	3	280	0.28	0.27	5.33	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
PHYSICAL B	5	721	0.72	0.70	12.00	0.00	0.00	0.00	0.00	0.00	1.60	0.00	0.00
PHYSICAL C	4	902	0.90	0.88	15.00	0.00	0.00	0.00	0.00	0.00	2.00	0.00	0.00
PHYSICAL D	17	1012	1.01	0.98	7.47	0.00	8.71	4.71	60.47	0.00	2.12	0.24	0.00
PHYSICAL E	3	1352	1.35	1.31	8.00	0.00	74.67	0.00	25.33	0.00	1.33	0.00	0.00
IMPAIRED A	2	198	0.20	0.19	0.00	0.00	0.00	0.00	0.00	32.00	0.00	0.00	0.00
IMPAIRED B	1	297	0.30	0.29	0.00	0.00	0.00	0.00	0.00	48.00	0.00	0.00	0.00
IMPAIRED C	1	421	0.42	0.41	8.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
IMPAIRED D	1	149	0.15	0.14	0.00	0.00	0.00	24.00	0.00	0.00	0.00	0.00	0.00
IMPAIRED E	3	521	0.52	0.51	0.33	0.00	0.00	0.00	81.33	0.00	0.00	0.00	0.00
IMPAIRED F	1	421	0.42	0.41	8.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
IMPAIRED G	1	99	0.10	0.10	0.00	0.00	0.00	0.00	8.00	8.00	0.00	0.00	0.00
IMPAIRED H	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
IMPAIRED I	1	631	0.63	0.61	12.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
IMPAIRED J	1	2239	2.24	2.17	1.00	0.00	0.00	0.00	280.00	0.00	8.00	0.00	0.00

Table VII.13

ALL OF NYS - PRIMARY CONDITION DURATION 6 MONTHS TO 1 YEAR

GROUP	SIZE	TOTAL COST	CMI	CMI SPECIFIC	<---- MEAN TIME PER MONTH ---- RN	LPN	HLTH AIDE	HMKR	PER AIDE	ENV AIDE	PT	OT	ST ---->
ALL	112	1148	1.15	1.00	5.56	0.32	35.46	2.08	49.11	1.79	1.73	0.66	0.43
REHAB A	2	890	0.89	0.77	4.00	0.00	0.00	0.00	0.00	0.00	12.00	0.00	0.00
REHAB B	1	2840	2.84	2.47	4.00	0.00	80.00	0.00	0.00	0.00	16.00	16.00	0.00
REHAB C	2	1555	1.55	1.35	16.00	0.00	0.00	0.00	0.00	0.00	4.00	4.00	4.00
REHAB D	6	2128	2.12	1.85	6.67	0.00	29.33	0.00	0.00	0.00	9.33	9.33	6.67
SPECIAL A	4	473	0.47	0.41	9.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
SPECIAL B	1	841	0.84	0.73	16.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
SPECIAL C	7	1332	1.33	1.16	7.71	0.57	54.86	0.00	50.86	0.00	0.57	0.57	0.00
MENT/BEHAV A	10	931	0.93	0.81	4.40	1.60	20.80	0.00	51.80	0.00	0.80	0.40	0.40
MENT/BEHAV B	17	1274	1.27	1.11	4.94	0.24	24.00	3.53	117.41	0.00	0.00	0.47	0.00
COMPLEX A	1	948	0.95	0.83	0.00	0.00	0.00	0.00	80.00	0.00	8.00	0.00	0.00
COMPLEX B	3	1211	1.21	1.06	10.67	0.00	53.33	0.00	0.00	0.00	2.67	0.00	0.00
COMPLEX C	10	2207	2.20	1.92	10.40	0.00	144.40	0.00	49.60	0.00	0.00	0.00	0.00
PHYSICAL A	2	767	0.77	0.67	6.00	0.00	24.00	0.00	0.00	0.00	4.00	0.00	0.00
PHYSICAL B	6	782	0.78	0.68	7.50	2.00	8.00	0.00	13.33	8.00	1.33	0.00	0.00
PHYSICAL C	3	941	0.94	0.82	13.33	0.00	8.00	0.00	26.67	0.00	0.00	0.00	0.00
PHYSICAL D	13	874	0.87	0.76	2.31	0.00	28.62	0.00	60.00	0.00	2.00	0.00	0.00
PHYSICAL E	5	1349	1.35	1.18	6.40	0.00	90.40	0.00	4.80	0.00	2.40	0.00	0.00
IMPAIRED A	8	160	0.16	0.14	0.50	0.00	0.00	7.63	2.00	12.00	0.00	0.00	0.00
IMPAIRED B	1	297	0.30	0.26	0.00	0.00	0.00	0.00	0.00	48.00	0.00	0.00	0.00
IMPAIRED C	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
IMPAIRED D	1	198	0.20	0.17	0.00	0.00	0.00	32.00	0.00	0.00	0.00	0.00	0.00
IMPAIRED E	3	685	0.68	0.60	0.00	0.00	0.00	26.67	84.00	0.00	0.00	0.00	0.00
IMPAIRED F	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
IMPAIRED G	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
IMPAIRED H	1	152	0.15	0.13	1.00	0.00	0.00	0.00	8.00	8.00	0.00	0.00	0.00
IMPAIRED I	4	1297	1.29	1.13	1.25	0.00	42.00	0.00	117.00	0.00	2.00	0.00	0.00
IMPAIRED J	1	2060	2.08	1.81	0.00	0.00	0.00	0.00	336.00	0.00	0.00	0.00	0.00

Table VII.14

ALL OF NYS - PRIMARY CONDITION DURATION 1 TO 5 YEARS

GROUP	SIZE	TOTAL COST	CMI	CMI SPECIFIC	MEAN TIME PER MONTH: RN	LPN	HLTH AIDE	HMHF	PER AIDE	ENV AIDE	PT	OT	ST
ALL	524	976	0.97	1.00	3.45	0.08	19.59	0.49	81.62	3.11	0.98	0.28	0.11
REHAB A	5	1242	1.24	1.27	1.60	0.00	0.00	0.00	46.40	19.20	6.40	3.20	3.20
REHAB B	4	1957	1.95	2.00	2.75	0.00	14.00	0.00	114.00	0.00	14.00	3.00	0.00
REHAB C	9	1795	1.79	1.84	5.33	0.00	32.44	0.00	48.44	0.00	6.44	4.55	[illegible]
REHAB D	11	2570	2.57	2.63	4.82	0.00	84.36	0.00	79.64	0.00	12.00	4.33	1.45
SPECIAL A	7	875	0.87	0.90	7.00	0.00	14.86	4.57	54.86	0.00	0.00	0.00	0.00
SPECIAL B	6	1422	1.42	1.46	4.00	0.00	13.33	0.00	163.33	0.00	1.33	0.00	0.00
SPECIAL C	27	1509	1.51	1.55	9.07	0.00	63.11	0.00	67.11	0.00	0.44	0.00	0.00
MENT/BEHAV A	29	966	0.96	0.99	6.31	0.00	24.00	0.00	56.55	4.14	0.45	0.00	0.14
MENT/BEHAV B	84	1046	1.04	1.07	2.01	0.00	17.81	0.48	117.52	2.52	0.43	0.05	0.00
COMPLEX A	6	542	0.54	0.56	6.83	0.00	13.33	0.00	9.33	0.00	0.00	0.00	0.00
COMPLEX B	22	823	0.82	0.84	4.00	0.00	17.09	0.00	66.18	3.64	0.36	0.00	0.00
COMPLEX C	28	1203	1.20	1.23	6.29	0.00	32.14	0.00	89.57	0.00	0.00	0.29	0.00
PHYSICAL A	6	470	0.47	0.48	7.50	0.00	0.00	0.00	0.00	0.00	1.33	0.00	0.00
PHYSICAL B	14	477	0.48	0.49	5.57	0.00	1.71	0.00	24.85	2.29	0.00	0.00	0.00
PHYSICAL C	15	870	0.87	0.89	4.53	0.00	28.53	0.00	48.53	0.00	1.13	0.00	0.00
PHYSICAL D	68	913	0.91	0.93	4.25	0.41	24.76	0.76	59.47	0.71	0.84	0.15	0.00
PHYSICAL E	27	1102	1.10	1.13	3.19	0.59	21.33	0.00	98.22	5.19	0.96	0.15	0.00
IMPAIRED A	31	269	0.27	0.28	0.35	0.00	4.77	1.35	12.65	16.00	0.35	0.00	0.00
IMPAIRED B	7	780	0.78	0.80	0.57	0.00	48.00	0.00	14.29	34.29	0.00	0.00	0.00
IMPAIRED C	4	987	0.39	1.01	15.00	0.00	0.00	4.00	20.00	8.00	0.00	0.00	0.00
IMPAIRED D	13	432	0.42	0.44	0.54	0.00	0.00	0.00	64.92	0.31	0.00	0.00	0.00
IMPAIRED E	31	626	0.63	0.64	0.29	0.00	3.74	1.81	86.32	2.58	0.26	0.00	0.00
IMPAIRED F	23	1080	1.08	1.11	0.78	0.00	5.57	0.00	154.09	2.09	0.35	0.00	0.00
IMPAIRED G	6	517	0.52	0.53	0.17	0.00	0.00	2.83	79.33	0.00	0.00	0.00	0.00
IMPAIRED H	8	817	0.82	0.84	1.63	0.00	0.00	0.00	109.00	0.00	1.00	0.00	0.00
IMPAIRED I	25	1089	1.09	1.12	0.76	0.00	4.48	0.00	162.72	0.00	0.00	0.00	0.00
IMPAIRED J	8	982	0.98	1.01	0.50	0.00	0.00	0.00	154.38	0.00	0.00	0.00	0.00

Table VII.15

ALL OF NYS - PRIMARY CONDITION DURATION MORE THAN 5 YEARS

GROUP	SIZE	TOTAL COST	CMI	CMI SPECIFIC	RN	LPN	HLTH AIDE	HMKR	PER AIDE	ENV AIDE	PT	OT	ST
					MEAN TIME PER MONTH								
ALL	942	986	0.98	1.00	1.54	0.04	6.98	2.01	116.26	5.91	0.73	0.30	0.15
REHAB A	3	845	0.84	0.86	2.67	0.00	0.00	5.33	0.00	21.33	6.67	1.33	1.33
REHAB B	23	1390	1.39	1.41	0.70	0.00	6.09	0.00	88.70	6.26	5.22	3.83	2.96
REHAB C	17	1742	1.74	1.77	2.53	0.00	4.24	0.00	129.65	7.53	6.59	3.35	2.35
REHAB D	18	2388	2.38	2.42	3.61	0.00	30.44	0.22	163.56	0.22	10.00	4.33	1.11
SPECIAL A	6	1058	1.06	1.07	9.83	0.00	0.00	0.00	87.33	0.00	0.00	0.00	0.00
SPECIAL B	3	1042	1.04	1.06	1.67	1.33	1.33	1.33	112.00	1.33	0.00	2.67	0.00
SPECIAL C	28	1507	1.50	1.53	5.43	0.29	34.86	0.29	133.86	1.43	0.71	0.00	0.00
MENT/BEHAV A	37	1059	1.06	1.07	2.62	0.00	15.46	0.00	118.60	4.65	0.24	0.00	0.03
MENT/BEHAV B	147	1383	1.38	1.40	1.36	0.05	8.76	2.48	190.15	0.87	0.44	0.05	0.00
COMPLEX A	5	498	0.50	0.50	2.00	0.00	0.00	0.00	11.20	52.00	0.00	0.00	0.00
COMPLEX B	15	727	0.73	0.74	3.20	0.00	8.27	2.53	67.47	2.93	0.53	0.00	[illegible]
COMPLEX C	43	1302	1.30	1.32	2.09	0.09	7.63	1.66	176.85	0.00	0.19	0.00	0.00
PHYSICAL A	7	336	0.33	0.34	6.29	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
PHYSICAL B	21	579	0.58	0.59	5.57	0.00	5.33	5.33	13.71	15.62	0.38	0.00	0.00
PHYSICAL C	18	559	0.56	0.57	1.72	0.44	5.33	1.78	52.22	1.78	0.89	0.00	0.00
PHYSICAL D	117	836	0.83	0.85	1.93	0.00	12.34	1.03	90.09	0.55	0.59	0.26	0.03
PHYSICAL E	51	1310	1.31	1.33	1.37	0.00	9.49	1.73	174.51	0.16	0.63	0.20	0.16
IMPAIRED A	85	282	0.28	0.29	0.88	0.00	0.19	4.64	11.72	21.04	0.05	0.00	[illegible]
IMPAIRED B	60	407	0.41	0.41	0.13	0.00	0.00	2.67	35.33	24.83	0.20	0.00	[illegible]
IMPAIRED C	8	873	0.87	0.89	0.00	0.00	0.00	0.00	137.00	4.00	0.00	0.00	0.00
IMPAIRED D	24	394	0.39	0.40	0.21	0.00	0.00	7.17	51.33	3.33	0.00	0.00	0.00
IMPAIRED E	58	758	0.76	0.77	0.33	0.00	5.79	0.00	106.26	4.69	0.00	0.00	[illegible]
IMPAIRED F	61	978	0.98	0.99	0.46	0.07	0.59	0.59	148.85	3.08	0.02	0.00	[illegible]
IMPAIRED G	6	493	0.49	0.50	0.67	0.00	0.00	0.00	74.00	0.00	0.00	0.00	0.00
IMPAIRED H	18	826	0.82	0.84	0.28	0.00	0.00	2.22	128.83	0.00	0.00	0.00	[illegible]
IMPAIRED I	37	1145	1.14	1.16	0.46	0.00	0.00	6.05	170.81	4.22	0.00	0.00	0.00
IMPAIRED J	26	1543	1.54	1.56	0.35	0.00	0.00	0.00	240.89	5.38	0.00	0.00	0.00

Table VII.16

PERSONAL CARE, NYC - NO INFORMAL SUPPORTS

GROUP	SIZE	TOTAL COST	CMI	CMI SPECIFIC	RN	LPN	HLTH AIDE	HMKR	PER AIDE	ENV AIDE	PT	OT	ST
					<---- MEAN TIME PER MONTH								----
ALL	195	1101	1.10	1.00	0.17	0.02	0.27	0.02	154.56	9.05	0.53	0.37	0.37
REHAB A	2	1011	1.01	0.92	0.00	0.00	0.00	0.00	0.00	48.00	4.00	4.00	4.00
REHAB B	7	1076	1.07	0.98	0.00	0.00	0.00	0.00	45.71	13.71	5.14	3.43	3.43
REHAB C	8	1798	1,79	1.63	0.00	0.00	0.00	0.00	163.50	12.00	5.00	3.50	2.50
REHAB D	3	2100	2.10	1.91	0.00	0.00	0.00	0.00	224.00	0.00	4.00	4.00	4.00
SPECIAL A	1	1212	1.21	1.10	0.00	0.00	0.00	0.00	196.00	0.00	0.00	0.00	0.00
SPECIAL B	2	1108	1.11	1.01	2.00	2.00	2.00	2.00	138.00	2.00	0.00	0.00	0.00
SPECIAL C	2	2290	2.29	2.08	4.00	0.00	0.00	0.00	336.00	0.00	0.00	0.00	0.00
MENT/BEHAV A	7	1082	1.08	0.98	0.00	0.00	0.00	0.00	174.86	0.00	0.00	0.00	0.00
MENT/BEHAV B	23	1863	1.86	1.69	0.09	0.00	0.00	0.00	298.09	2.09	0.00	0.00	0.00
COMPLEX A	1	198	0.20	0.18	0.00	0.00	0.00	0.00	0.00	32.00	0.00	0.00	0.00
COMPLEX B	3	1023	1.02	0.93	0.00	0.00	0.00	0.00	149.33	16.00	0.00	0.00	0.00
COMPLEX C	5	1939	1.94	1.76	2.40	0.00	0.00	0.00	285.60	0.00	0.80	0.00	0.00
PHYSICAL A	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
PHYSICAL B	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
PHYSICAL C	2	582	0.58	0.53	0.00	0.00	0.00	0.00	94.00	0.00	0.00	0.00	0.00
PHYSICAL D	12	968	0.97	0.88	0.00	0.00	0.00	0.00	153.33	0.00	0.33	0.00	0.00
PHYSICAL E	9	1442	1.44	1.31	0.00	0.00	0.00	0.00	232.89	0.00	0.00	0.00	0.00
IMPAIRED A	17	309	0.31	0.28	0.00	0.00	2.82	0.00	13.41	32.00	0.00	0.00	0.00
IMPAIRED B	15	330	0.33	0.30	0.00	0.00	0.00	0.00	29.87	23.47	0.00	0.00	0.00
IMPAIRED C	4	662	0.66	0.60	0.00	0.00	0.00	0.00	91.00	16.00	0.00	0.00	0.00
IMPAIRED D	9	451	0.45	0.41	0.00	0.00	0.00	0.00	60.44	12.44	0.00	0.00	0.00
IMPAIRED E	14	810	0.81	0.74	0.00	0.00	0.00	0.00	121.71	9.14	0.00	0.00	0.00
IMPAIRED F	21	1120	1.12	1.02	0.19	0.00	0.00	0.00	176.95	2.29	0.00	0.00	0.00
IMPAIRED G	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
IMPAIRED H	2	941	0.94	0.85	0.00	0.00	0.00	0.00	152.00	0.00	0.00	0.00	0.00
IMPAIRED I	18	1117	1.12	1.01	0.00	0.00	0.00	0.00	175.11	5.33	0.00	0.00	0.00
IMPAIRED J	8	1694	1.69	1.54	0.50	0.00	0.00	0.00	269.50	0.00	0.00	0.00	0.00

Table VII.17

PERSONAL CARE, NYC - WITH INFORMAL SUPPORT & DURATION GREATER THAN 3 MONTHS

GROUP	SIZE	TOTAL COST	CMI	CMI SPECIFIC	RN	LPN	HLTH AIDE	HMKR	PER AIDE	ENV AIDE	PT	OT	ST
					<---------- MEAN TIME PER MONTH								---------->
ALL	475	1048	1.04	1.00	0.29	0.01	0.01	1.98	148.87	7.73	0.48	0.22	0.14
REHAB A	3	1255	1.35	1.30	0.00	0.00	0.00	0.00	77.33	16.00	8.00	2.67	2.67
REHAB B	12	1708	1.71	1.63	0.67	0.00	0.00	0.00	146.33	0.00	5.67	4.33	[illegible]
REHAB C	5	1761	1.76	1.68	0.00	0.00	0.00	0.00	150.40	6.40	8.80	2.40	2.40
REHAB D	7	1938	1.93	1.85	1.14	0.00	0.00	0.00	184.57	0.00	7.43	3.43	1.71
SPECIAL A	2	594	0.59	0.57	0.00	0.00	0.00	16.00	80.00	0.00	0.00	0.00	0.00
SPECIAL B	2	1473	1.47	1.41	0.00	0.00	0.00	0.00	238.00	0.00	0.00	0.00	0.00
SPECIAL C	10	1927	1.92	1.84	2.50	0.00	0.00	0.00	290.00	0.00	0.00	0.00	0.00
MENT/BEHAV A	17	1028	1.03	0.98	0.00	0.00	0.00	0.00	160.47	5.65	0.00	0.00	0.00
MENT/BEHAV B	76	1669	1.67	1.60	0.13	0.00	0.00	2.87	262.21	0.52	0.21	0.10	0.00
COMPLEX A	2	728	0.73	0.70	2.00	0.00	0.00	0.00	40.00	24.00	4.00	0.00	0.00
COMPLEX B	3	1411	1.41	1.35	2.67	0.00	0.00	0.00	205.33	0.00	0.00	0.00	0.00
COMPLEX C	14	1440	1.44	1.38	0.86	0.00	0.00	0.00	225.43	0.00	0.00	0.00	0.00
PHYSICAL A	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
PHYSICAL B	6	549	0.55	0.52	2.83	0.00	0.00	0.00	48.67	16.00	0.00	0.00	0.00
PHYSICAL C	1	651	0.65	0.62	0.00	0.00	0.00	32.00	0.00	0.00	8.00	0.00	0.00
PHYSICAL D	29	1014	1.01	0.97	0.55	0.00	0.00	1.66	157.52	0.00	0.00	0.00	0.00
PHYSICAL E	18	1819	1.82	1.74	0.67	0.00	0.00	0.00	286.00	0.00	0.00	0.00	0.00
IMPAIRED A	6.	250	0.25	0.24	0.07	0.00	0.00	3.93	10.56	24.92	0.05	0.00	0.00
IMPAIRED B	42	434	0.43	0.42	0.00	0.00	0.00	3.33	36.75	29.33	0.08	0.00	0.00
IMPAIRED C	6	789	0.79	0.75	0.00	0.00	0.00	0.00	122.00	5.33	0.00	0.00	0.00
IMPAIRED D	8	446	0.45	0.43	0.00	0.00	0.00	10.00	62.00	0.00	0.00	0.00	0.00
IMPAIRED E	44	684	0.68	0.65	0.00	0.00	0.00	1.82	104.73	4.00	0.00	0.00	0.00
IMPAIRED F	45	1050	1.05	1.00	0.13	0.09	0.09	0.80	162.93	3.73	0.02	0.00	0.00
IMPAIRED G	3	588	0.59	0.56	0.00	0.00	0.00	0.00	94.67	0.00	0.00	0.00	0.00
IMPAIRED H	9	795	0.79	0.76	0.00	0.00	0.00	0.00	128.44	0.00	0.00	0.00	0.00
IMPAIRED I	28	1228	1.23	1.17	0.07	0.00	0.00	0.00	197.71	0.00	0.00	0.00	0.00
IMPAIRED J	14	1570	1.57	1.50	0.29	0.00	0.00	0.00	251.14	0.00	0.00	0.00	0.00

Table VII.18

CHHA, NYC - NO INFORMAL SUPPORTS

GROUP	SIZE	TOTAL COST	CMI	CMI SPECIFIC	MEAN TIME PER MONTH: RN	LPN	HLTH AIDE	HMKR	PER AIDE	ENV AIDE	PT	OT	ST
ALL	51	1296	1.29	1.00	9.25	0.24	26.20	0.08	44.71	4.08	3.22	1.10	0.00
REHAB B	4	2072	2.07	1.60	6.00	0.00	69.00	0.00	0.00	0.00	11.00	8.00	0.00
REHAB C	2	1503	1.50	1.16	6.00	0.00	0.00	0.00	40.00	0.00	8.00	8.00	0.00
REHAB D	2	2915	2.91	2.25	8.00	0.00	168.00	0.00	0.00	0.00	12.00	4.00	0.00
SPECIAL A	4	1548	1.55	1.20	16.00	0.00	20.00	0.00	84.00	0.00	0.00	0.00	0.00
MENT/BEHAV B	4	959	0.96	0.74	10.00	0.00	0.00	0.00	70.00	0.00	0.00	0.00	0.00
COMPLEX A	2	525	0.52	0.41	10.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
COMPLEX B	2	1836	1.84	1.42	10.00	0.00	0.00	0.00	190.00	22.00	0.00	0.00	0.00
PHYSICAL A	3	581	0.58	0.45	5.33	0.00	16.00	0.00	0.00	0.00	2.67	0.00	0.00
PHYSICAL B	7	738	0.74	0.57	5.14	1.71	18.29	0.00	0.00	22.86	1.14	0.00	0.00
PHYSICAL C	10	925	0.92	0.71	8.00	0.00	31.60	0.00	8.00	0.00	2.80	0.00	0.00
PHYSICAL D	9	1605	1.60	1.24	8.89	0.00	16.89	0.44	124.89	0.44	3.56	0.00	0.00
IMPAIRED A	1	3381	3.38	2.61	60.00	0.00	0.00	0.00	0.00	0.00	4.00	0.00	0.00
IMPAIRED F	1	210	0.21	0.16	4.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Table VII.19

CHHA, NYC - WITH INFORMAL SUPPORTS

GROUP	SIZE	TOTAL COST	CMI	CMI SPECIFIC	MEAN TIME PER MONTH: RN	LPN	HLTH AIDE	HMKR	PER AIDE	ENV AIDE	PT	OT	ST
ALL	349	1137	1.14	1.00	9.57	0.07	31.61	0.69	11.75	1.77	2.82	1.05	0.34
REHAB A	8	1173	1.17	1.03	9.00	0.00	0.00	0.00	10.00	0.00	7.50	2.50	1.00
REHAB B	11	1591	1.59	1.40	6.91	0.00	45.09	0.00	1.45	0.00	10.55	2.91	0.35
REHAB C	17	2065	2.06	1.82	11.53	0.47	34.82	0.00	0.00	0.00	12.24	5.65	1.18
REHAB D	32	2171	2.17	1.91	10.25	0.00	44.13	4.00	20.13	0.00	9.88	6.00	1.38
SPECIAL A	7	639	0.64	0.56	9.71	0.00	10.29	0.00	0.00	0.00	0.57	0.00	0.00
SPECIAL B	1	966	0.97	0.85	12.00	0.00	36.00	0.00	0.00	0.00	0.00	0.00	0.0
SPECIAL C	13	1399	1.40	1.23	15.69	0.00	61.23	0.00	0.00	0.00	0.00	0.00	0.00
MENT/BEHAV A	14	1175	1.17	1.03	10.57	0.00	48.57	0.00	16.00	0.00	1.14	0.00	0.00
MENT/BEHAV B	30	1090	1.09	0.96	8.27	0.00	52.00	0.00	11.20	0.00	1.60	0.13	0.00
COMPLEX A	9	818	0.82	0.72	10.67	0.00	14.22	0.00	0.00	20.00	0.00	0.00	0.00
COMPLEX B	24	972	0.97	0.85	9.50	0.00	31.83	0.00	17.33	0.00	1.00	0.00	0.17
COMPLEX C	31	1353	1.35	1.19	11.87	0.00	69.16	0.00	13.03	0.00	0.00	0.00	0.00
PHYSICAL A	16	451	0.45	0.40	8.00	0.00	0.00	0.00	0.00	0.00	0.00	0.50	0.00
PHYSICAL B	31	631	0.63	0.55	9.29	0.26	0.00	3.61	3.61	7.48	0.39	0.00	0.26
PHYSICAL C	8	658	0.66	0.58	9.00	0.00	10.50	0.00	10.00	4.00	0.00	0.00	0.00
PHYSICAL D	55	841	0.84	0.74	8.36	0.15	24.22	0.00	4.80	0.58	2.04	0.29	0.00
PHYSICAL E	20	1323	1.32	1.16	7.80	0.00	29.00	0.00	76.20	7.00	1.80	0.40	0.00
IMPAIRED A	7	275	0.27	0.24	4.00	0.00	0.00	0.00	0.00	0.00	1.14	0.00	0.00
IMPAIRED B	2	917	0.92	0.81	6.00	0.00	40.00	0.00	0.00	0.00	4.00	0.00	0.00
IMPAIRED C	2	1787	1.78	1.57	34.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
IMPAIRED D	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
IMPAIRED E	3	1324	1.32	1.16	12.00	0.00	74.00	0.00	0.00	0.00	0.00	0.00	0.00
IMPAIRED F	4	781	0.78	0.69	7.00	0.00	32.00	0.00	0.00	0.00	2.00	0.00	0.00
IMPAIRED G	1	210	0.21	0.18	4.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
IMPAIRED H	1	873	0.87	0.77	8.00	0.00	0.00	0.00	0.00	0.00	8.00	0.00	0.00
IMPAIRED I	3	350	0.35	0.31	6.67	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
IMPAIRED J	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

sample sizes naturally become quite small. Metro, Upstate and the LTHHCs are not included due to very small samples in this type of stratification. The major findings are as follows:

- The presence or lack of ISS continues to be a predicative variable when region, program and case mix are stratified.
- The presence of an ISS appears to decrease the cost to a greater extent in CHHAs than in the PC program (although sample sizes of CHHA patients with no ISS are fairly small).
- A much higher portion of the CHHA patients have an ISS than is the case for the PC program.
- Across virtually all patient categories, the CHHA, for patients with an ISS, has significantly lower costs than the PC program. Note that the higher average cost in the CHHA (Table VII.19 as compared to Table VII.17 is explained by the higher case mix of the CHHA.

VII.F PROGRAM BOUNDARY RECOMMENDATIONS

The analysis in this section of the report has focused on program boundaries. Boundaries were reviewed by considering program capabilities and intent, characteristics of patients in the different programs, and the relative cost of a program. The recommendations that follow are a direct consequence of the analysis. The focus of these recommendations is to improve the cost efficiency and quality of home care by better matching the needs of a client to the direct capabilities of a program to meet those needs.

VII.F.1 Use of CMI in the LTHHCP.

The caps currently set for the LTHHCP are based upon average SNF costs. The impact of the cap may be a factor in decreasing the program costs, but it also has had the impact of limiting access by higher care patients. On the other hand, low care patients easily fit under the cap. The analysis on the distribution of RUG-HHC categories in LTHHC showed that the middle intensity patient dominated its caseload. Currently, Medicaid payment for RHCF care is based on the casemix intensity of patients and since one of the intents of LTHHCP is to serve as an alternative to patients qualified to receive RHCF care, an equal footing with its insitutional counterpart should be implemented.

RECOMMENDATION 1. A CMI should be used to set case mix specific caps at a program level. Whether the RUG-II or the RUG-HHC CMIs should be used is a matter for debate. The traditional concept of tying the cap to the RHCF rate would lead to the use of the RUG-II CMI while the RUG-HHC CMI is more directly related to the cost of caring for the patient at home.

VII.F.2 Informal support system influence on CMI

As would be expected, the analysis shows that patients with an ISS

have a cost that is generally 10-20% lower than patients without an ISS. There would thus appear to be an empirical basis, as well as the clinical basis, for setting a different payment level or resource target depending on the status of the ISS.

Beyond the payment issues, the potential use of a different set of CMIs depending on ISS status must also be considered. Use of multiple CMI sets could tend to be confusing and administratively difficult for both NYS and providers. Despite this, there appears to be sufficient rationale for use of different CMIs in the case of ISS. The CMI specific column on Tables VII.9 and VII.10 show that the relative cost between groups varies significantly depending on ISS status.

The CMIs for patients with no ISS take on much higher levels for patients in the most disabled groups. Thus the combination of high impairment and no ISS leads to a relatively higher cost than low or middle impairment and no ISS. As examples, consider the following:

High Disability	No ISS	ISS
Mental B	1.61	1.20
Complex C	1.50	1.24
Impaired J	1.64	1.35

The greater variation in the cost of care across the case mix groups for patients with no ISS should be reflected in the CMIs and in resource targets set on the RUG-HHC basis.

RECOMMENDATION 2. At a minimum, separate CMIs and resource targets based on the status of the informal support system (ISS) should be used for the high disability RUG-HHC categories. This is functionally equivalent to bringing the ISS into the classification system by splitting a RUG-HHC category into a "With Informal Support" and a "Without Informal Support" group. If administratively feasible, this feature should be extended to all RUG-HHC categories.

VII.F.3 Program cost differences

When case mix is controlled for, the PC program is approximately 10% more expensive than the CHHA and 20% more expensive than the LTHHCP (only direct care dollars are available in the analysis). Tables VII.17 and VII.19 show this is also the case when ISS and NYC are used as additional stratification variables. It appears the caps in the LTHHCP and the Medicare limitations in CHHA payments, as compared to the PC program does lead to cost differences.

The above observations argue for either a lower placement of patients in the PC program (shifting more to the CHHA or LTHHCP depending on expected duration and eligibility) or the use of additional reimbursement controls in the PC program. Some specific examples which highlight the differences in the programs can be noted by comparing aide time per month for two of teh largest groups (Mental B and Physical D):

AIDE TIME/MONTH

Program	Mental B	Physical D
PC	213.4	149.1
LTHHCP	97.1	103.4
CHHA	40.5	32.4

The impact of the Medicare limitations on the use of aide service for CHHA patients is clearly evident, as well as the relatively uncapped use of aide time in the PC program.

RECOMMENDATION 3. Reimbursement or service authorization controls should be placed on the PC program to address and decrease the difference in casemix controlled cost between the PC program and other home care programs. The RUG-HHC system provides a framework on which to base these controls.

VII.G DISTRIBUTION OF TYPES OF PATIENTS BETWEEN PROGRAMS

The previous sections have shown significant differences in the distribution of patients across case mix groups when programs are compared. There is relatively little differences in types of patients across regions and ISS (with the exception that Mental B and Physical D are much larger groups for patients without an ISS). Overall the programs are fairly well targeted to the types of patients for which the programs were originally intended. However, there are clearly exceptions to this general observation and the RUG-HHC should be used to further refine the placement of patients in programs. These recommendations are based on the assumption that all 3 programs are available in a locality. Obviously, if only 1 or 2 programs are available, the programs will necessarily be broader in scope and a mixture of services from the different programs arranged for a patient.

RECOMMENDATION 4. Patients in the Impaired categories should be exclusively assigned to the PC program. Currently the CHHAs and LTHHCPs do not have major numbers of patients in the Impaired groups; thus the change would be incremental.

RECOMMDATION 5. Significant numbers of PC patients fall within the Rehabilitation hierarchy. These patients are most likely receiving services from multiple home care programs and agencies as provided for in the PC regulations. In order to focus care of these patients within a single program, patients in the Rehabilitation hierarchy should be cared for in the CHHA or LTHHC program.

RECOMMENDATION 6. Approximately 3% of the PC program patients are in the Special Care hierarchy receiving relatively low levels of RN time. Patients in the Special Care hierarchy should be limited to CHHA or LTHHCP placement.

RECOMMENDATION 7. A number of patients in the PC program fall within the Complex hierarchy. Patients in this hierarchy generally require skilled management of their care. These patients should be limited to CHHA or LTHHCP placement.

RECOMMENDATION 8. A partition or boundary between the CHHA program and the LTHHC programs is one of duration of need or condition. The RUG-HHC classification does not contain a duration characteristic in it since duration was not found to be a predictor of resource use differences. A length of stay (LOS) or duration boundary between the CHHA and LTHHC programs is recommended and 90 days is suggested for consideration.

A summary of the recommended placement of patients in home care programs is presented in Table VII.20. Where no specific recommendation was made above on placement, the recommendation contained in the Table is the observed pattern. A basic dichotomy present in the recommended placements is between patients needing frequent skilled services and monitoring and patients who do not. This is very apparent in the recommended placements of patients in the Rehabilitation, Special and Complex hierarchies versus the Impaired hierarchy. For the Mental/ Behavioral and Physical hierarchies, the picture is more mixed because the conditions defining the hierarchy can be addressed by both skilled professional level of services and by trained health or personal care aides with the level of need determined by presence of co-existing condition s and stability of the patient's condition. For these hierarchies both the "skilled care" programs and the PC program are recommended as feasible placements which reflects current practice. The choice at a patient level between the "skilled" or PC program would be made on the basis of the patient's need for frequent skilled monitoring or services.

An alternative to the present recommendation is to continue the skilled-not skilled dichotomy at the hierarchy level and to recommend only "skilled" program placement for both the Mental/Behavioral and Physical hierarchies. This was not done because of the high number of PC patients (almost 30 percent) in both hierarchies and the capability of PC program as presently defined in regulation to appropriately provide service to these two populations.

The result of the above changes would be incremental. CHHAs and the LTHHCs would provide care to Rehab, Special Care, Mental, Complex and Physical patients. PC patients would be heavily concentrated in Impaired and Mental with some patients in the Physical groups. The overlap, in type of case mix groups, for the CHHA and LTHHCP would continue to be separated as per the original concepts for these programs: CHHAs would focus on short term, acute patients while the LTHHCP would focus on patients with conditions that are likely to exceed 90 days.

The impact of the above recommendations would be: (1) much clearer focus to the programs; and (2) somewhat lower cost. In broad terms, focus of the three programs could be characterized as follows: (1) PC-Impaired and Mental; (2) CHHA-acute, patients with rehab and clinical needs; (3) LTHHCP-long term, patients with rehab and clinical needs. These recommendations would tend to increase the "clinical" aspects (versus the ADL and IADL aspects) of patient care in the LTHHCP while decreasing the "clinical" aspects to the PC program. The focus of the CHHAs would have very little change.

Table

VII.20

Recommeded Distribution of Patients by
RUG - HHC Hierarchy

RUG-HHC Hierarchy	Length of Stay: Under 90 days	Length of Stay: Over 90 days
Rehabilitation	Certified Home Health or Long Term Home Health	Long Term Home Health
Special	Certified Home Health or Long Term Home Health	Long Term Home Health
Mental/Behavioral	Certified Home Health, Long Term Home Health and/or Personal Care	Long Term Home Health or Personal Care
Complex	Certified Home Health or Long Term Home Health	Long Term Home Health or Personal Care
Physical	Certified Home Health or Long Term Home Health	Long Term Home Health or Personal Care
Impaired	Personal Care	Personal Care

VIII. SCREENING AND ASSESSMENT FOR HOME CARE

In order to implement the program boundary recommendations at the patient level, information must be gathered about the patient for purposes of screening the patient into a home care program. Once directed into home care, an assessment of the patient is required in order to establish an efficient plan of care utilizing the resources available to a patient to meet the needs of the patient.

To respond to these two needs, two assessment processes were designed. The first is compact since its role is to collect the minimal set of information needed for program screening. The second is much longer since it constitutes a care planning assessment which requires the identification of patient problems and needs and the design of services from both the ISS and formal provider system to address the needs and problems of the patient. In this section, the design considerations of both are presented. A draft copy of the care planning assessment and instructions for its completion are contained in the Appendix of this report.

NOTE ON FORMAT OF DRAFT ASSESSMENT. The draft assessment is not presented in 'usable form'; that is, the layout of it is not fully specified. The emphasis in designing the assessments was on content, not layout. While layout is important before an assessment can be used, form layout is a design step requiring a high level of resource committment as well as compromise on very specific content items in order to meet layout requirements. This level of resource committment at this stage of development of the assessment was not made. In areas of the assessment instrument where the layout is critical in conveying a care planning approach, a layout is presented. A form design professional is needed here to achieve a layout balance between adequate space, overall form length considerations, and readability.

VIII.A <u>PROGRAM PLACEMENT SCREENING</u>

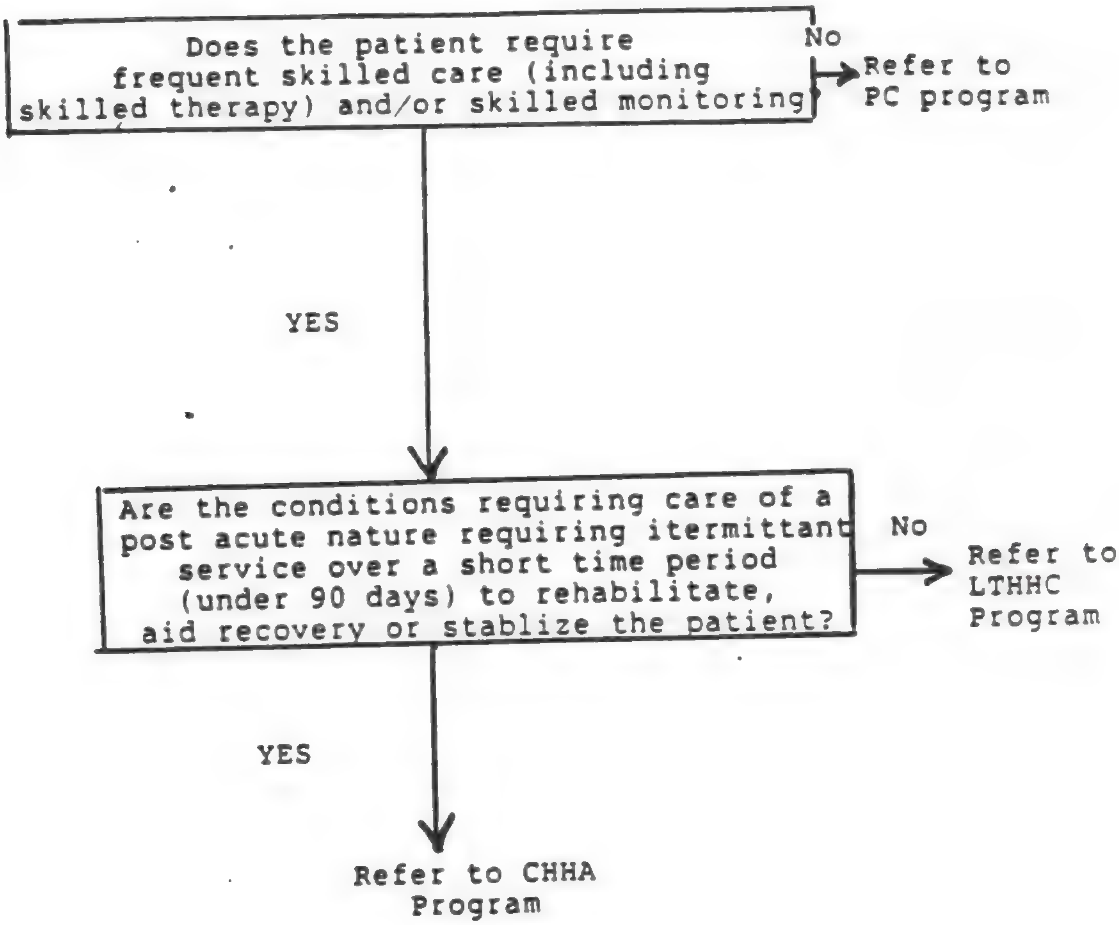
> **RECOMMENDATION 9. A screening process for directing patients to the recommended home care program should be implemented. For hospitalized patients, the screening process should become part of the existing PRI/SCREEN system. For community based patients, the screen should be incorporated into existing intake and referral processes of home care.**

The program boundaries presented earlier build on two dimensions: need for skilled care and long versus short duration. Judgements on each are the basis for the screening logic presented in Figure VIII.A. The format of the screening logic parallels that contained on the PRI/SCREEN and this new logic should be added to it. With this new added logic the PRI/SCREEN more totally covers the discharge planning decisions of hospitalized patients.

For persons seeking home care services from the community or from other institutional settings, the screening logic should be incorporated into the existing home care referral and intake processes. In

FIGURE VIII.A

PROGRAM SCREENING LOGIC



communities with Community Alternative System Agencies (CASAs), the screening logic should be made part of the initial intake work up of the patient. In communities where Area Offices of Aging are active with information and referral services, the logic should be incorporated into the initial information gathering phase of such services. For persons who are self referred to a home care provider in a community without a CASA, the provider should apply the logic to determine the appropriateness of the person for their program and refer the person to an appropriate program if required. In CASA communities, the person should be referred to the CASA by the provider.

While the dominant use of the screening logic will be on intake into home care, the screen should also be used when a patient is ready for discharge from a home care provider and need for continuing home care services has been established. In this instance, the screen logic should be applied as part of the discharge planning obligation of the provider.

VIII.B. PATIENT ASSESSMENT TOOL FOR HOME CARE (PATH).

The comprehensive assessment developed under this research is called the Patient Assessment Tool for Home Case (PATH). The PATH is designed to be part of care planning for a patient and not just a form for collecting data.

The PATH addresses several different assessment needs within the home care system: the need for a standardized patient assessment process and tool across home care programs and the need for a care planning process which explicitly addresses the role of the informal support system in caring for the patient.

> **RECOMMENDATION 10.** The Patient Assessment Tool for Home Care (PATH) should be adopted as the standardized assessment and care planning instrument for persons receiving home care services under the Medicaid program.

VIII.B.1. The Path Assessment Process.

While assessment can have many meanings and have many different uses in the field of long term care, it has a specific definition in the PATH. Assessment is the process of individualized evaluation of a client in order to determine the appropriate type and intensity (hours) of care/services needed to enable the client to function at a maximum level of independence. This has been labelled a level of care determination. Traditionally the care level for a client is determined through an informal process where the assessor gathers, through self appraisal and/or interview techniques, whatever client information is judged important. As the number of clients and services increased, assessment instruments have been introduced to guide the assessment process and create more uniform decisions. An assessment instrument is a written form containing organized groups of assessment questions commonly used to evaluate a client; it ensures that all the client's characteristics are assessed and organizes the answers for

ready accession. It may provide guidelines to integrate all the answers and decide on the level of care needed.

The PATH requires assessment of the client's ability to function on various dimensions and measures the degree to which the client needs services/care. Each section of the PATH has implications for completing the plan of care/services that the client requires. The PATH also includes a CARE PLAN SUMMARY, in which all the client requirements are integrated to determine what specific services/care the client needs, who will deliver them and how often they are needed.

The PATH provides a standardized, comprehensive and objective client assessment to determine the extent of functional ability and the need for care and services. It gives specific guidelines to assure that needed services are identified, and, by evaluating the client's level of functioning, motivation and attitude toward his/her situation, it improves the client's acceptance of the Care Plan. The types and hours of service the informal caregivers will provide is specially assessed, as well as those that will be provided by the formal services.

There are two purpose to the PATH. The first major purpose is to provide a means to identify the full range of medical, social, psychological, environmental, and functional client needs (as expressed by the client, family, various sources of formal information, and observed by the assessor) and to identify the services and care required to meet those needs. The second major purpose is to integrate all the care needs into a comprehensive Care Plan, including how much the client can care for self, what kind of provider will provide additional care and the number of hours/days the care is needed.

The PATH also contains characteristics of the client which are used in the RUG-HHC classification. With these linkage features of the RUG-HHC system such as the resources used can be integrated into the care planning process.

VIII.B.2 Design of the Path

The PATH was designed to serve its two purposes. The starting point in its design was the development of the research assessment instrument. This research instrument established the patient dimensions and descriptors which would be available for use in a classification system and which would be required to be placed on the PATH. Data collection using this research instrument provided a good opportunity to test questions and responses on assessment items.

During the analysis phase of the research, it became clear in Workgroup discussion that measuring involvement of the informal support in care delivery could only be done within the context of a care plan which identified patient needs and the resources to meet those needs. This switch from considering the ISS as a classification dimension to a care planning consideration prompted a review of assessment instruments in order to identify care planning approaches

embedded within the instrument.

Instruments that were reviewed for this purpose included ACCESS from the Monroe County Long Term Care Placement Program, DMS-1/HAA from New York State, the Coordinated Care Management Corporation (Buffalo) assessment, and the FASTEP (Full Assessment Tool for Elderly Placement). Of note, each of these forms is in use. The PATH reflects the collective experience of users of each of these forms.

The assessment approach embodied in the PATH borrows heavily from the FASTEP. This approach is a problem oriented one. As problems are identified, the impact on the care plan is also identified and on many patient dimensions, an explicit consideration of the patients ISS as a resource is suggested and promoted.

The PATH has undergone review within the research staff and by outside parties. During the design process, members of the Workgroup were contacted to obtain their input on specific design questions. As drafts of the PATH were produced, copies were circulated to staff of the Long Term Care Casemix Project for review and comment. Further, since many sections of the PATH are similar in content and layout to currently used and well accepted assessments, the strengths they have are present in the PATH by reference.

VIII.B.3. Features of the Path.

Just like the research tool and the patients within the home care programs themselves, the PATH contains a large diversity of dimensions in order to be appropriate for all patients in all settings. The PATH is composed of 14 sections presented in draft form on 15 pages. Information collected on a patient includes client identification, client demographics, administrative, informal supports and household composition, medical history, psycho-behavioral condition, phycho-social condition, activities of daily living, community living activities, medications, services and treatments, and physical home assessment.

VIII.B.3a. Developing a Path Plan.

The PATH is constructed so that on the left hand side of the page the assessor evaluates the client's functional ability and/or the client's needs. On the right side of the page, the assessor evaluates how that need is to be met. This last evaluation is, in essence, building the items for the Care Plan and will construct the kind of care/services that are required, who is able to provide this care/service (i.e. informal supports or formal service) and the frequency that they are required.

The Care Plan Summary is the last page of the PATH and is the ending point of the assessment. The Care Plan Summary is designed to summarize the care planning process that was part of the assessment throughout the PATH. It follows a logical pattern which leads the careplanner from the summary of the client's problem to determination of the service package which best solves these problems.

There are seven basic steps involved in the Care Plan Summary. These steps are reflected in the seven main columns of the Care Plan form.

1. Identifying the problem or similar groups of problems taken from the assessment pages.

2. Setting a desired outcome for each problem area.

3. Determining the type of provider(s) to provide needed help in each of the problem areas.

4. Setting a pattern of delivery for each provider (days and hours).

5. Identifying the dates services are to begin.

6. Identifying the payment source for each type of service (if a formal service).

7. Providing the estimated cost of the service according to the type of provider and the frequency of the services for each problem area.

VIII.B.3b. <u>Assessment Target Feature of the Path</u>.

As the results of applying the RUG-HHC classification to the data-base demonstrates, many persons in home care have low frequency and low overall resource use requirements. The scope of the PATH for this type of client far exceeds the requirements in order to respond to these needs. An assessment for this type of patient would consist of recording that no need exists for most items except for a few ADL/IADL dimensions.

There are two ways to accomodate this type of patient in the assessment process: (1)exempt the patient from the form, or (2) modify the form so that only the items which the care plan must address get formally assessed. The latter approach was incorporated into the PATH.

The first question on the PATH is the assessment targetting question which requires a Global Assessment of the patient. The Global Assessment incorporates several different dimensions of the patient into one question which gets answered YES or NO. If the several conditions apply and the answer is YES, only selected portions of the PATH (Agency Identification, Client Demographics and Care Plan Summary) need to be completed. If the conditions do not apply, the full PATH must be completed.

The conditions which must all be met in order to substantially abbreviate the steps in completing the PATH are:

- client only requires formal care to meet ADL/IADL needs;

- the number of hours of care is X or less per week; and
- for all other needs, which may be medical in nature, the patient's informal support system or the patient themself manage.

The emphasis of this Global Assessment question is on the unmet needs of the patient. If these needs are few, the PATH assessment process is greatly simplified so that a balance between low service needs and a simple assessment is achieved. When the amount and type of needs increases, the PATH assessment process responds by increasing the breadth of assessment and care planning which must occur. The Assessment Target feature is a way to increase in care planning efforts when the patient's needs are high and greatly reducing it when the needs are low.

VIII.B3c. Medical Condition Codes

The medical history and status of a patient is collected in two locations on the PATH; in the Primary Problem question and in the Diagnoses and Sensory Impairments question. In order to collect data on the medical status of the patient, the assessor is asked to record the patients diagnosis using a set of Medical Condition codes specifically developed for the PATH. These codes are in list form and the assessor is asked to transcribe these codes to the PATH to indicate the condition. This list with the transcription option was selected over the second choice, a list on the PATH with check off of applicable conditions for several reasons.

1. A medical condition is something which the care plan should address. Linking the care plan to a check-off condition within a layout design was difficult to do.

2. Many patients have few if any of the listed medical conditions. If a check-off list option was used, a significant portion of the PATH would be occupied by a list where very few responses are recorded.

3. The list of medical conditions can easily be expanded or contracted to reflect changing needs and to capture information on the prevalence of particular conditions. If the second option was selected, to change the list would require a new layout of the PATH. In the current design, a new list can be distributed through a Health Memorandum.

The current option is flexible and allows the PATH to change with the times.

VIII.B.4 Use and Completion of the Path

The PATH encompasses a comphrehensive assessment of a home care client. Included are medical, social, and environmental aspects of the client. It is designed to be completed by individuals skilled in assessment and care planning for home care. In some cases, a multidisciplinary assessment process involving a social worker and a nurse

will be required because of the nature of the problems of the client. In others, because of local practice, a single caseworker may have full responsibility.

The PATH is designed for use within the existing client assessment and care planning protocols established for personal care, long term home health care, and certified home health care programs. It is also designed for use by CASAs.

While an important use of the PATH will be the initial assessment and care plan, the PATH should be used each time the care plan must be updated or the service plan reauthorized. The existing home care programs each have regulations specifying these cycles and no changes are recommended.

In addition to decisions on these use and design options, the State must typeset the PATH and field test the typeset version. The PATH has undergone extensive content review and revision of content. In addition, much of the content has been operationally tested during the data collection for this research or on the assessment instruments which were used as resources in development of the PATH. For example, the Care Plan Summary of the PATH was extracted from the FASTEP (also developed under a contract to RPI). The FASTEP is presently used by several CASAs for assessment and care planning.

A field test of a typeset PATH is principally a test of the typeset format addressing issues of spacing, readability, and length. The simple question of whether there is enough space in a box on the form to fill in the requested information will be answered.

Prior to typesetting, the State should decide whether the PATH layout should be designed with keypunch ease as a criterion. Consideration at the layout phase of this use of the collected data will improve the quality and productivity of keypunch.

VIII.B.4 Implementation Needs And Options.

The design of the PATH is not finalized. Depending of direction from the State, the PATH could be modified to deemphasize some features and to increase emphasis on others. In the design of the PATH, some of the options available to the State became apparent. These are presented and discussed here.

Assessment Target Hours Ceiling. The ceiling on formal care hours within the Assessment Target Logic remains unspecified. New York State needs to set a ceiling value. This ceiling, once set, can be promulgated in several ways;

1. It can be set as a requirement which all locales must apply with no local option.

2. It can be set as a maximum with a local option (County level) to set a 'local ceiling' below the State Ceiling in programs which the County controls. For example, a county might set

their 'local ceiling' at half the States ceiling.

Under either, the State must decide on a number.

Setting Patient Specific Resource Targets. An option for use of the PATH is to use it in conjunction with a resource use target established by the RUG-HHC category of the patient. As part of the PATH care planning process, the RUG-HHC category of the patient would be determined and a resource target specific to this category recorded on the Care Plan Summary of the PATH. With this knowledge, the assessor would then design the Care Plan and compute its cost. A direct comparison would then be possible. Guidelines could be established to define an 'acceptable variation range.' Special attention could be given to patients falling outside of this range.

Expanding List of Medical Conditions. The way in which the Medical condition of the patient is recorded through a look up list gives the State the opportunity to expand this list to collect data on prevalence of medical conditions which are of particular policy importance to the State. Some contemporary examples of this might be AIDS and Alzheimers. This option should be explored fully by the State.

IX. MANAGEMENT INFORMATION SYSTEM FOR HOME CARE

The development of the RUG-HHC classification system presents to the State and to home care agencies the opportunity to improve their understanding of home care and home care patients. This opportunity centers on identifying the uses of data which the RUG-HHC classification provides. In this section, these opportunities are discused in the context of Management Information Systems (MIS).

There are two ways to think of an MIS. The first is to consider it as a data system. The second is to consider the MIS as a management tool which allows monitoring and promotes control in order to attain set objectives. The latter is preferred and NYS is urged to promote this orientation within itself and when dealing with the home care providers and programs which it regulates.

This section discusses MIS at the two levels that systems will be implemented, the State level and the provider level. While they are presented separately, they are related. For example, the form of the MIS at a provider level will determine the technology that is used to capture data at the State level.

IX.A STATE LEVEL MIS.

At the present time, the State has little centralized and usable data on persons receiving home services. Because of this void, the State is unable to detect and monitor changes in home care, is unable to respond to unfavorable changes, and is left without quantitative information to support or suggest needed policy changes,

> **RECOMMENDATION 11. The State should develop a patient level information system on home care using RUG-HHC elements as the base. This information system would span all home care providers. It should have features which promote timeliness of the data and timely management reports.**

IX.A.1 Classification Instrument For Home Care (CIH).

The Classification Instrument for Home Care (CIH) is a short patient assessment instrument which has contains the classification elements of the RUG-HHC system. It is designed to be the base document of the state's home care information system.

Aside from the Administrative Data, the CIH asks the patients condition on a total of 44 patient characteristics, the majority of which address whether the patient has a specific medical condition or needs a specified type of service. (A copy is contained in the Appendix to this report).

The CIH has six separate sections. These are:

I. ADMINISTRATIVE DATA. Identification information of the

completing organization and the patient. Includes providing a reason for completion of the CIH.

II. MEDICAL EVENTS. The medical conditions present and medical treatments needed by the patient in the home care settings. Selected conditions and treatments are listed on the form; the assessor indicates those which apply.

III. ACTIVITIES OF DAILY LIVING(ADLs). Four ADLs are reviewed; Eating, Transfer, Bathing, and Toileting. For classification purposes, they are collapsed to an ADLSCORE.

IV. INSTRUMENTAL ACTIVITIES OF DAILY LIVING (IADLs). Three IADLs are reviewed; Preparing Light Meals, Cooking, and Shopping. For classification purposes, they are collapsed to an IADLSCORE.

V. BEHAVIORS. Five mental/behavioral characteristics of patients are reviewed. They are: Memory Deficit, Impaired Decision Making, Verbal Disruptive, Infantile Behavior and Socially Inappropriate Behavior. These characteristics are used in determining whether a patient's mental/behavioral status is sufficiently impaired to place them in the Mental hierarchy group of the RUG-HHC.

VI. SPECIALIZED SERVICES. This section of the CIH is used to record the need of the patient for Physical, Occupational and Speech Therapy.

The data collected on the CIH can be used to classify a patient into one of the RUG-HHC categories by applying the classification logic to the recorded data. The hierarchy category of the patient is determined by using data from the Specialized Services, Behaviors and Medical Events sections of the CIH. Once the hierarchy is determined, the ADLSCORE is found from the Activities of Daily Living section (see Table IX.1). This score may uniquely determine the RUG-HHC category for the patient. If not, the IADLSCORE is found from responses to the IADL questions and the unique RUG-HHC category determined (see Table IX.2). Use of the classification flowchart, presented in Section VI, will assist in this assignment process.

Table IX.1

ADLSCORE Value of CIH ADL Responses.

ADL	Response	ADLSCORE Value
Eating	1. Feeds Self	1
	2. Requires Intermittent Supervision	2
	3. Requires Continual Help	3
	4. Totally fed by hand	4
	5. Tube or parenteral feeding	5
Transfer	1. Requires no assistance	1
	2. Requires Intermittent Supervision	2
	3. Requires one person	3
	4. Requires equipment and one person	4
	5. Cannot transfer	5
Bathing	1. Requires no assistance	1
	2. Requires intermittent checking	2
	3. Requires continual help	3
	4. Client is bathed	4
Toileting	1. Requires no assistance	1
	2. Requires intermittent supervision	2
	3. Requires constant assistance	3
	4. Incontinent, not toileted	4
	5. Incontinent, toileted	5

Table IX.2

IADLSCORE Values of CIH IADL Responses

IADL	Response	IADLSCORE Value
Prepare light meals	1. Totally able	1
	2. Limited ability	2
	3. Unable to participate	3
	4. Totally unwilling	3
Prepare and Cooks meals	1. Totally able	1
	2. Limited ability	2
	3. Unable to participate	3
	4. Totally unwilling	3
Shopping	1. Totally able	1
	2. Limited ability	2
	3. Unable to participate	3
	4. Totally unwilling	3

With the addition of questions on resource use by type and amount, the elements on the CIH are the patient level data elements of the home care information system. For each program, the CIH would have different rolls in terms of timing of data collection and program specific data elements added to it.

In CHHAs, the CIH would function as a discharge abstract. On admission, the patient descriptor items would be completted. At discharge, the following information on the patient would be collected:

- length of stay (days)
- resources used (visits/hours by skill level)
- discharge status/destination

The completed CIH would then be sent to the State.

In the LTHHCP and PC program, the CIH would be completed on admission and at utilization review/reauthorization points. The amount and type of authorized/budgetted services would be recorded and the information transmitted to the State.

For Medicaid patients in any home care program, the CIH elements can be extracted directly from the PATH. This activity could be assigned to non professional personnel. For other patients, the patient characteristics would have to be collected through an assessment of the patient. Since assessment is an integral part of home care services, CIH assessment requirements will overlap with existing assessment activities.

IX.A.2 Transmitting CIH Data.

Transmitting is the process followed by a provider to submit its data to the State. There are many options available, some more desirable than others. The State should plan on all options being used simultaneously.

Source Document. In this option, the source document (a form) with the assessment responses recorded on it is submitted to the State. The State's steps in processing this document include key entry, error checking, and returning a computer generated facsimile to the provider for verification.

Electronic Media. The State would receive an electronic medium with the required data coded on it. Some mediums included floppy disk and tapes. The provider themselves would be responsible for key entry and for primary error checking. The State would review submitted data for errors and report errors to the provider for correction.

Computer Communications. This represents a sophisticated system design in which the data exchange would be done from the provider's computer to the State's over a communcations link. This exchange could involve humans at each end controlling the process but could

also be done by the computers without human intervention. At pre-arranged times, the computers would establish communication and all 'new' data would be tranmitted.

From the States direct resource perspective, the latter two options are preferable. These are also preferable from a perspective of promoting good agency management. Data would be available on the agency's computer and could be used in a variety of ways for internal agency management.

IX.B. PROVIDER LEVEL MIS.

NYS should encourage the establishment and use of MIS at the provider level. This encouragement can take on two different forms with the choice being dependent on the relationship between the State and the provider.

IX.B.1 Government or pseudo government organizations.

The role that the State can take in MIS design and development can be strong. In these organizations, NYS should:

- require that an MIS be installed
- identify the specifications which the MIS must meet, and may even elect to develop the MIS software and distribute it.

NYS should specify an MIS which is an aid to decision making, program monitoring, management, and monitoring employee performance. The basic design of the system should be one of providing feedback to the user. An MIS which helps the employee in their responsibilities will also be an aid to management. Some of the uses that an agency level MIS can have are:

- Comparison with similar programs.
- Comparison of performance of workers with respect to caseload, service amounts authorized, use of informal supports, etc.
- Budget projections of cost and revenues.

The state roles in this MIS activity should extend beyond just defining the system by including training in how to use MIS data in management.

IX.B.2 Regulated Agency.

In a provider where the State's role is primarily that of a regulator, the States formal role in MIS would be limited to specifying what data is to be reported and promulgating technical specifications on the transmission of data. While it is expected that management of these agencies would define their own MIS needs, the State's authority is limited. The MIS needs in this type of agency would be met by commercial MIS vendors who would develop systems which respond to State

requirements and would be designed to meet individual agency needs and management style.

Aside from exercising its authority in these matters, the State should promote the use of MIS by home care providers. Sharing the MIS design it is developing for the first type of home care provider would demonstrate management uses. Contact with industry representatives to urge them to concentrate educational sessions on MIS use would also serve the goal of promoting good home care services management.

X. IMPLEMENTATION PERSPECTIVES AND ISSUES.

The products of the research represent a significant achievement. The RUG-HHC classification system is a comprehensive description of the different types of home care patients. The PATH represents a change to uniformity in assessment which extends beyond the same instrument to the level of the same common language. The care planning approach on the PATH, a problem orientation, is supported by the design of the instrument and encourages the indentification of patient problems which must be addressed in the care plan. Comparisions of patient types to descriptions of home care programs led to refining the placement patterns in order to improve the match between patient need and program goal and capability. The quality of the products should encourage implementation ease. Nevertheless, implementing either the products or recommendations will require a concerted effort by DOH and DSS, the purpose of this section is to raise questions as well as perspectives related to implementation.

X.1 OUTLIERS TO THE CLASSIFICATION.

The classification is based on a sample of patients receiving home care in diverse geographic areas from a variety of different programs. Despite the sample intent and design to be exhaustive of this population, there might be persons receiving home care for whom the 27 categories of classification may not be appropriate and a 28th category called 'other' will be needed. The structure of the classification is such that all patients get classified so that identification of a patient for whom the classification doesn't work will be difficult. The State needs to consider the 'outlier' and decide whether to identify then and then determine how to identify them. This may take on greater importance if the RUG-HHC is used within a reimbursement system.

X.2 IMPLEMENTATION PLAN AND TIMELINE.

An implementation plan and timeline need to be established as both a tool for controlling the process and for notice to the industry of when changes are to occur. The timeline must recognize the lead times that providers need in order to prepare for the change. This is especially true of changes which will require modifications to current systems or acquisition of new systems by the provider. An example of this is the implementation of the State Home Care MIS requiring data submission. With sufficient notice, providers would have time to set up systems to transmit this data in an electronic form. If sufficient time is not given, providers would submit paper source documents in order to meet the submission requirement. This would place an avoidable burden on the State.

X.3 OPERATIONAL EXPERIENCE.

While the components of both assessment items and the care plan have been separately tested, they have not been tested as a system. This testing is needed to gain experience which only large scale and implementation critical use can give. Even with this testing, there will be issues which will arise during full use which will have to be resolved.

APPENDIX 1.1

ACKNOWLEDGEMENT

ACKNOWLEDGEMENT

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Members of the Home Care Classification Work Group
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Visiting Nursing Association of Buffalo, New York Inc.
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Onondaga County Department of Long Term Care Services
Home Care Division
Civic Center
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Broome County Department of Health
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Franklin County Nursing Service
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Visiting Nurse Association
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Ulster County Department
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Westchester County Department
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Community Alternatives
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Montefiore Medical Center
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111 East 210th Street
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Massapequa, NY 11758

Medical Personnel Pool, Inc.
361 Delaware Avenue
Buffalo, NY 14215

Dutchess County
Department of Social Service
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Poughkeepsie, NY 12601

Franklin County
Department of Social Services
Courthouse
Malone, NY 12953

New York City
Human Resource Agency
Office of Home Care Services
109 East 16th Street
New York City, NY 10003

Medical Personnel Pool
Capital District, Inc.
90 State Street Suite 552
Albany, NY 12207

APPENDIX 1.2

PATIENT/CLIENT ASSESSMENT TOOL FOR HOME CARE

(PATH)

DRAFT

PATIENT/CLIENT ASSESSMENT TOOL FOR HOME CARE (PATH)

Global Assessment

Client requires less than X hours of formal care per week for only ADLs and/or IADL needs (refer to Section VIII and Section IX of this document for clarification) that the client and/or the client's informal supports can not manage.

Yes, complete Section I, Section II and the Care Plan ___
No, complete entire PATH. ___

SECTION I AGENCY IDENTIFICATION INFORMATION

1. Agency Name ________________
2. State Identification No. ________________
3. I.D./Case No. ________________

SECTION II CLIENT DEMOGRAPHICS, NUMBERS AND INCOME

1. CLIENT NAME (Last-First-M.I.) Please Print

2. USUAL ADDRESS (Street) (City) (State) (Zip)

3. CLIENT'S PHONE NO. OTHER NO. (Specify Owner)
___-___ / ___-___

4. SEX
1. Male 2. Female

5. DATE OF BIRTH _ _ /_ _ / _ _ _ _

6. S.S. NO. _ _ _ / _ _ / _ _ _

7. MEDICAID NO. Expiration Date
________ / /

8. MEDICARE A B

9. BC/BS No. & PLAN

10. OTHER COVERAGE & NO.

11. INCOME TYPE
__ Public Assistance __ Social Security __ Supplemental Security Income __ Veterans Benefit __ Food Stamps

__ Energy Assistance __ Rent Assistance __ Salary __ Pension __ Other (Specify)

SECTION III OTHER ADMINISTRATIVE DATA

1. DATE OF ASSMT. __ / __ / ____

2. REASON FOR PATH COMPLETION _
   1= Initial Assessment
   2= Reactivation of Services
   3= Reauthorization Assessment
   4= Other

3. PRIMARY REASON FOR REFERRAL TO HOME CARE ____

1. Recent illness/trauma with hospitalization - no surgery.
2. Recent illness/trauma with surgery.
3. Recent illness/trauma without hospitilization or surgery.
4. Re-emergence of chronic illness with hospitalization.
5. Re-emergence of chronic illness without hospitalization.
6. Progressive deterioration of illness and/or general physical deterioration in functioning or capabilities of client.
7. Reduced mental functioning.
8. Psychosocial dysfunction.
9. Need to supplement informal support(s).
10. Other.

4. LIVING ARRANGEMENTS
   (i.e., private home, hospital, SNF, etc.)
   Current: __________
   Usual: __________

   Specify Current Address(if different than usual address)

____

5. PRIMARY CONTACT PERSON (Name) (Relationship) (Phone No.) (Address)

____

6. CONTINUING CARE PHYSICIAN OR PROVIDER (e.g.Clinic) (Name) (Phone No.) (Address) Frequency of Visits

____

7. PRIMARY LANGUAGE ___ English
   Other(Specify): ____________________
   Speaks English ____ Understands English ____
   1. Yes 2.No

____

8. AGENCIES WHICH PROVIDED SERVICE DURING PAST 6 MONTHS
   (Name) (Phone No.) (Service) (Contact person)

A. ____
B. ____
C. ____

SECTION IV INFORMAL SUPPORTS AND HOUSEHOLD MEMBERS

Source of Information

(Check all that apply) ___ Client __ Family/Friends __ Medical Records __ Physician __ Other(Specify)

1.HOUSEHOLD COMPOSITION/WHO CLIENT LIVES WITH (Check all that apply)

__ Lives Alone __ Spouse ___ Child __ Sibling ___ Other Relative

Other (Specify): ___________________ Total Number in Household ___________

2.PRIMARY CAREGIVER TRAITS

__ IF NO INFORMAL SUPPORTS/CAREGIVERS EXIST, CHECK THIS BOX AND SKIP TO SECTION V.

Please answer questions A-D using key.

Key:
1= Yes
2= No

A. Wants to keep client in the community __
B. Is capable of providing care (physically & emotionally) __
C. Is capable of learning instructions __
D. Will give care only if support services given __

---

3. INFORMAL SUPPORTS

NAME/RELATIONSHIP	AGE	PHONE NO.	DAYS AND SPECIFIC HOURS AVAILABLE	CARE PLAN DESCRIBE: Reliability Caregiving History, Physical and/or Emotional Status Working Schedule, Support Needs for Caregiver
(primary caregiver)				
A.___				
B.___				
C.___				

4.FAMILY INVOLVEMENT AND HOUSEHOLD PROBLEMS

If Client's family members are not involved in caring for client or if other problems/special situations exist, explain below:

SECTION V MEDICAL CONDITIONS

Source of Information (Check all that apply) __ Client __ Family/Friends __ Medical Records __ Physician __ Other(Specify)

---

1. PRIMARY PROBLEM: THE MEDICAL CONDITION REQUIRING THE LARGEST AMOUNT OF CAREGIVER TIME. NOT NECESSARILY THE ADMISSION DIAGNOSIS BY THE PHYSICIAN.

ICD-9 Code of medical problem .... __ __ __ . __ __ Primary
__ __ __ . __ __ Secondary

If codes cannot be located, print medical name here: ____________________

2. DIAGNOSES AND SENSORY IMPAIRMENTS

Describe any medical condition in the table below. The Codes are on the back of the previous page. See instructions for qualifiers and definitions.

MEDICAL CONDITION	CODE	DURATION Key: 1= less than 3 months 2= 3-9 months 3= over 9 months or, specify if less than 3 months	PROGNOSIS Key: 1= recover or improve 2= stable/client managed 3= stable/managed by others 4= deteriorate	MUST COMPLETE IF CARE PLAN WILL BE AFFECTED BY CONDITION: Describe how condition affects client, client compensations/adaptation, special problems or needs, further assessment required
A.				
B.				
C.				
D.				
E.				

3. PERTINENT HOSPITALIZATIONS/OUTPATIENT TREATMENTS REASON/PROCEDURE (Current)	DATE	MUST COMPLETE IF CARE PLAN IS AFFECTED: Describe effects of [illegible] [illegible]
A.		
B.		
C.		

SECTION VI PSYCHO-BEHAVIORAL CONDITION

Source of Information (Check all that apply) __ Client __ Family/ Friends __ Medical Records __ Physician __ Other(Specify)

---

1. VERBAL DISRUPTION: BY YELLING, BAITING, THREATENING, ETC. ____

1= None during the past four weeks. (May have verbal outbursts which are not disruptive.)

2= Verbal disruption one to three times during the past four weeks.

3= Short-lived disruption at least once per week during the past four weeks or *predictable* disruption regardless of frequency (for example, during specific care routines, such as bathing).

4= Unpredictable, recurring verbal disruption *at least once per week*, but not daily.

5= Daily episodes of unpredictable verbal disruption.

2. PHYSICAL AGGRESSION: ASSERTIVE OR COMBATIVE TO SELF OR OTHERS WITH INTENT FOR INJURY. (FOR EXAMPLE, HITS SELF, THROWS OBJECTS, PUNCHES, DANGEROUS MANEUVERS WITH WHEELCHAIR). ____

1= None during the past four weeks.

2= Unpredictable aggression during the past four weeks (whether mild or extreme), *but not at least once per week*.

3= Predictable aggression during specific care routines or as a reaction to normal stimuli (for example, bumped into), regardless or frequency. May strike or fight.

4= Unpredictable, recurring aggression at least once per week during the past four weeks, but not daily, for no apparent or foretold reason (that is, not just during specific care routines or as a reaction to normal stimuli).

5= Daily episodes of unpredictable physical aggression.

3. DISRUPTIVE, INFANTILE OR SOCIALLY INAPPROPRIATE BEHAVIOR: CHILDISH, REPETITIVE OR ANTISOCIAL PHYSICAL BEHAVIOR WHICH CREATES *DISRUPTION WITH OTHERS* (FOR EXAMPLE, CONSTANTLY UNDRESSING SELF, STEALING, SMEARING FECES, SEXUALLY DISPLAYING ONESELF TO OTHERS), EXCLUDE VERBAL ACTIONS. READ THE INSTRUCTIONS FOR OTHER EXCLUSIONS. ____

1= No infantile or socially inappropriate behavior, whether or not disruptive, during the past four weeks.

2= Displays this behavior, but is not disruptive to others (for example, rocking in place).

3= Disruptive behavior during the past four weeks, but <u>not</u> at least once per week.

4= Disruptive behavior at least *once per week* but not daily during the past four weeks.

5= Daily episodes of disruptive behavior.

4. HALLUCINATIONS: VISUAL, AUDITORY OR TACTILE PERCEPTIONS THAT HAVE NO BASIS IN EXTERNAL REALITY. ____

1= No 2= Yes, experienced at least once per week during the past four weeks.

3= Daily episodes.

Frequency Code for Questions 5 and 6:
Condition Status:
1= NO/MINIMAL PROBLEM - Little/No effect on CARE PLAN.
2= MODERATE FREQUENCY - Enough to constitute consideration in CARE PLAN.
3= FREQUENT (OVER 1/WK) OR SPECIAL PROBLEM (e.g. ERATIC) - Requires constant/active consideration in CARE PLAN.

5. MEMORY DEFICIT: KNOWN HISTORY OF FORGETFUL BEHAVIOR - DANGEROUS TO SELF/OTHERS (E.G., SHUT OFF GAS, PUT OUT CIGARETTES, WATCH FOOD THAT IS COOKING-BURNS FOODS, ETC.) ____

6. IMPAIRED DECISION-MAKING: MAKES SERIOUSLY INAPPROPRIATE DECISIONS OR UNABLE TO MAKE ANY DECISION REGARDING ROUTINE MATTERS (E.G., FAILS TO PROTECT SELF). THIS IS NOT DUE TO LACK OF KNOWLEDGE. ____

7. OTHER PROBLEM BEHAVIOR (Specify):

8. DOES CLIENT HAVE A DIAGNOSED MENTAL HEALTH PROBLEM OR HISTORY OF RECEIVING MENTAL HEALTH SERVICES? ____ NO ____ YES

DESCRIBE: ______________________________

9. CLIENT REQUIRES: ____ MENTAL HEALTH ASSESSMENT

____ MENTAL HEALTH REFERRAL

SECTION VII PSYCHO-SOCIAL CONDITION

Source of Information (Check all that apply)

__ Client __ Family/Friends __ Medical Records __ Physician

__ Other(Specify)

CONDITION	DESCRIBE IF CARE PLAN IS AFFECTED. Coping mechanisms to be kept intact strengths to be maintained, potential for decline, etc.
1. EMOTIONAL STRENGTH & MOTIVATION (to be independent and remain home) __ Highly motivated, Realistically oriented __ Good emotional strengths Motivated with support __ Poor unrealistically motivated, Requires regular guidance __ Passive, afraid or insecure Needs much support __ Actively resistive Negative or hostile __ Cannot rate	
2. STRESSFUL LIFE EVENTS DURING PAST YEAR Examples: Death of spouse/Major caregiver, Major illness/Major change in functional status (client), Divorce/Separation, Relocation, Retirement, Financial Problems, etc. ____ NO, none ____ YES, Specify: ____ Insufficient Information	

"UNCTIONAL ASSESSMENT
I TON VIII ACTIVITIES OF DAILY LIVIVING(ADL)

Source of Information (Check all that apply) __ Client __ Family/ Friends __ Medical Records __ Physician __ Other(Specify): ____________

Answer each question according to how each task was completed 60% of the time during the past four weeks. Read the Changed Condition Rule and definitions in the instructions.

ACTIVITY (What Client Can Do)	✓	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
:TING: PROCESS OF GETTING FOOD BY ANY MEANS FROM THE RECEPTACLE TO THE BODY (FOR EXAMPLE, PLATE, CUP, TUBE). ___ : Feeds self without supervision or physical assistance. May use adaptive equipment. : Requires intermittent supervision (that is, verbal encouragement/guidance) and/or minimal physical assistance with minor parts of eating, such as cutting food, buttering bread or opening milk carton. 3= Requires continual help (encouragement/teaching/ physical assistance) with eating or meal will not be completed. 4= Totally fed by hand: client does not manually participate. 5= Tube or parenteral feeding for primary intake of food. (Not just for supplemental nourishments.								
BILITY: HOW THE CLIENT MOVES ABOUT. ___ Walks with no supervision or human assistance. May require medical device (for example, a walker), but not a wheelchair. · Walks with intermittent supervision (that is, verbal cueing and observation). May require human assistance for difficult parts of walking (for example, stairs, ramps). : Walks with constant one-to-one supervision and/or constant physical assistance. 4= Wheels with no supervision or assistance, except for difficult maneuvers (for example, elevators, ramps). May actually be able to walk, but generally does not move. 5= Is wheeled, chairfast or bedfast. Relies on someone else to move about, if at all.								
TRANSFER: PROCESS OF MOVING BETWEEN POSITIONS, TO/FROM BED, CHAIR, STANDING, (EXCLUDE TRANSFERS TO/FROM BATH AND TOILET). ___ 1= Requires no supervision or physical assistance to complete necessary transfers. May use equipment, such as railings, trapeze. 2= Requires intermittent supervision (that is, verbal cueing, guidance) and/or physical assistance for difficult maneuvers only. 3= Requires one person to provide constant guidance, steadiness 1/or physical assistance. .ient participates in transfer. 4= Requires lifting equipment and one person to provide constant supervision and/ or physically lift. 5= Cannot and is not gotten out of bed.								

-ING: PROCESS OF WASHING BOD- PARTS, -LUDING GETTING TO THE BATHING WATER. -S MAY INCLUDE THE SHOWER, BATHTUB, OR -) BATH.

Requires no human supervision or support. May use adaptive equipment.

Requires intermittent checking and observing. May require assistance for minor parts of the task, transferring in and out of the bath and bathing back.

3= Requires continual help (supervision or physical assistance) with most parts of bathing.

4= Client does not participate. Client is bathed in bath, shower or bed by another person.

-RSONAL HYGIENE: PROCESS OF GROOMING, -CLUDING COMBING HAIR, WASHING FACE, -SAVING AND BRUSHING TEETH.

-esponsible for and receives no human -upervision or assistance with personal -rooming.

-quires intermittent verbal cueing or -servation; and/or requires assistance -th difficult parts of grooming.

3= Requires continual help (supervision and/or physical assistance) with all or most of personal grooming.

4= Client does not participate; another person performs all aspects of personal hygiene.

-RESSING: PERFORMING THE NECESSARY AND -OUTINE FUNCTIONS OF DRESSING.

1= Does no human supervision or physical assistance.

2= May need intermittent supervision (verbal encouragement and/or minimal physical assistance) for the proper arrangement and retrieval of clothing.

3= Requires continual help (encouragement/teaching and/or physical assistance) with difficult parts of dressing.

4= Has to be completely dressed by another person; client does not participate.

5= Bed gown is generally worn due to condition of client.

TOILETING: PROCESS OF GETTING TO AND FROM A TOILET OR USE OF OTHER TOILETING EQUIPMENT, SUCH AS BEDPAN), TRANSFERRING ON AND OFF TOILET, CLEANSING SELF AFTER ELIMINATION AND ADJUSTING CLOTHES.

1= Requires no supervision or physical assistance. May require special equipment, such as a raised toilet or grab bars.

2= Requires intermittent supervision for safety or encouragement; or minor physical assistance (for example, clothes adjustment or washing hands).

3= Continent of bowel and bladder. Requires constant supervision and/or physical assistance with major/all parts of task including applicances (i.e., colostomy, ileostomy, urinary catheter).

4= Incontinent of bowel and/or bladder, and is not taken to a toilet.

5= Incontinent of bowel and/or bladder, but is taken to a toilet every two to four hours during the day and as needed at night.

F. ADL REHAB GOALS: Describe client's potential for ADL rehab. training, etc.

SECTION IX INSTRUMENTAL ACTIVITIES OF DAILY LIVING (IADLs)

Source of Information (Check all that apply)
__ Client __ Family/ Friends __ Social Worker
__ Other(Specify):________________

ACTIVITY STATUS:
1. Totally able (with or without equipment)
2. Limited, participates but does not complete task fully
3. Unable to participate at all
4. Totally unwilling to perform

NEED TO BE MET BY (Check all that apply)

ACTIVITY (What Client Can Do)	STATUS NO	CLIENT	INFORMAL SUPPORT		FORMAL SERVICE				COMMENTS (Describe limitations, specific functional level)
		✓	SPECIFY NAME	SPECIFIC DAYS & HOURS	TO TRAIN CLIENT ✓	To Monitor ✓	To Perform Activity ✓	SPECIFIC DAYS & HOURS	
1. GET TO PLACES OUT OF WALKING ABILITY (Use Transportation)	☐								
2a. PREPARE LIGHT MEALS/REHEAT MEALS	☐								
2b. PREPARE AND COOK MEALS	☐								
3. DO HOUSEWORK/ CLEANING	☐								
4. DO LAUNDRY	☐								
5. DO SHOPPING	☐								
6. USE TELEPHONE	☐								
7. HANDLE PERSONAL BUSINESS/FINANCES	☐								

8. REHAB GOALS. Describe client's potential for rehab., training, etc	**9. EQUIPMENT:** Describe equipment needed

SECTION X MEDICATIONS

Source of Information (Check all that apply) __ Client __ Family/ Friends __ Medical Records __ Physician

__ Other(Specify): ____________________

1. CURRENT MEDICATION (Name)	DOSE	ROUTE	FREQUENCY (TIMES/DAY OR WEEK	NEED TO BE MET BY (Check all that apply): CLIENT	INFORMAL SUPPORT		FORMAL SERVICE			
				✓	SPECIFY NAME	DAYS AND HOURS	To Train Client or Support	To Monitor Or Supervise	To Assist or Administer	FREQUENCY (DAYS & HOURS)
A.										
B.										
C.										
D.										
E.										
F.										
G.										
H.										

1. ALLERGIES/ SENSITIVITIES (Specify

2. HOW DOES CLIENT OBTAIN MEDICATION?

3. COMMENTS (Other medications taken during hospitalization, side effects, compliance):

SECTION XI. SERVICES/TREATMENT

Source of Information __ Client __ Evaluation by assessor __ Medical Records __ Physician
(Check all that apply)
__ Other(Specify): ____________________

TREATMENT	FREQUENCY (TIME/DAY OR WEEK)	NEED TO BE MET BY (Check all that apply)							COMMENTS
		CLIENT	INFORMAL SUPPORT		FORMAL SERVICE				
		✓	SPECIFY NAME	DAYS AND HOURS	TO TRAIN CLIENT ✓	To Train Support ✓	[illegible] ✓	FREQUENCY (DAYS & HOURS)	
A. Ambulation									
B. Catheter care									
C. Catheter insertion/sterile irrigation replacement									
D. Chemotherapy									
E. Decubitus Care: Enter the stage (0-5) as defined in the instructions									
F. Dialysis									
G. Heat treatment									
H. Intravenous injection									
I. Nasogastric feeding									
J. Nurse monitoring: a. Diet (Specify Type): b. Vital signs (Specify Range): c. Wound site d. Medications e. Other (Specify):									

SECTION XI. SERVICES/TREATMENT

Source of Information (Check all that apply) __ Client ___ Evaluation by assessor __ Medical Records __ Physician

__ Other(Specify):____________________

TREATMENT	FREQUENCY (TIME/DAY OR WEEK)	NEED TO BE MET BY (Check all that apply)							COMMENTS
		CLIENT	INFORMAL SUPPORT		FORMAL SERVICE				
		✓	SPECIFY NAME	DAYS AND HOURS	TO TRAIN CLIENT ✓	To Train Support ✓	Perform or Assist with Treatment ✓	FREQUENCY (DAYS & HOURS)	
K. Parenteral feeding									
L. Ostomy care									
M. Oxygen therapy									
N. Pain control-severe									
O. Radiation treatments									
P. Range of motion									
Q. Respiratory Care/Oxygen Therapy									
R. Skincare - Prevention									
S. Stasis ulcer									
T. Suctioning									
U. Teaching/Education (Specify):									
V. Tracheostomy care/ suctioning									
W. Transfusions									
X. Ventilation									
Y. Wound Care (specify):									
Z. Other:									

SECTION XII SPECIALIZED SERVICES

Therapies: Provided or supervised by a licensed professional. Refer to instructions.

Visits and Time Per Week: Enter the current average number of visits and total time per week provided by each therapy within the program boundaries defined for the client. See instructions for qualifiers in counting days and time.

Level

1= Service not provided.
2= Evaluation visit only, no active follow up.
3= Improve to become independent.
4= Improve, but will continue to require assistance.
5= Stabilize, maintain current status to prevent deterioration.
6= Slow the deterioration process.

	Level	Average Number of Visits Per Week	Hours Per Week	Comments
1. Physical Therapy.......	____	____	____	
2. Occupational Therapy..	____	____	____	
3. Speech Therapy........	____	____	____	
4. Other Therapy.......... (Specify)	____	____	____	

SECTION XIII. PHYSICAL HOME ASSESSMENT

____ No home assessment done ____ if client has no home, check box and skip to Care Plan Summary

Source of information: ____ observation (through home visit)
Date of home visit ___ / ___ /___

____ client ____ social worker ____ family/friends
____ other (specify): ________________

PHYSICAL CONDITION	A Problem Yes ✓	A Problem No ✓	Need will be met by (check all that apply): Rehab. Home	Install Equipment	Train Client	Other (Specify):	DESCRIBE PROBLEM AND ITS EFFECT ON CARE PLAN.
1. DOORWAY WIDTHS							
2. FIXTURE HEIGHTS/ REACHES							
3. STAIRS (Inside and/ or Outside							
4. READILY DISCERNABLE HAZARDS (e.g. wiring, rodents, loose stairs							
5. GENERAL HABITABILITY/ SAFETY (e.g. plumbing, heating, stove, telephone, etc.)							
6. OTHER PROBLEMS (Specify):							

CLIENT NAME: ____________________ case no

ADDRESS ____________________

PHONE NO. ____________________

SECTION XIV: CARE PLAN SUMMARY

DATE: ____________________

PREPARED BY ____________________

REFERRAL TO (Check all that apply)
☐ Adult Home ☐ CHHA ☐ Home Health Aid
☐ LTHHCP ☐ Personal Care ☐ Other (Specify): ____________________

NEXT ASSESSMENT IN:
☐ 30 Days ☐ 60 Days ☐ 90 Days ☐ 120 Days ☐ 6 Mos. ☐ Other (Specify): ____________________

A. PROBLEMS	DESIRED OUTCOME	NEED TO BE MET BY INFORMAL SUPPORTS AND/OR FORMAL SERVICES NAME AND PHONE NO	ESTIMATED UNITS HRS., TIME, DAYS	START DATE	PAYMENT SOURCE(S)	ESTIMATED COST
1.						
2.						
3.						
4.						
5.						

COMMENTS ON CARE PLAN (Part A) AND SPECIFY "EXCEPTIONS" TO "SERVICE OPTIONS":

MEDICATION COST ____________________
EQUIPMENT COST ____________________
PHYSICIAN VISITS COST ____________________
TOTAL $

B. DOES CLIENT NEED A SERVICE WHICH IS NOT AVAILABLE? EXPLAIN.

C. IS CLIENT ON A WAITING LIST FOR ANY SERVICES NEEDED? [NO] [YES] AGENCY/SERVICE/HOUSING DATE / /

D. PHYSICIAN STATEMENT/ ORDERS NEEDED? [NO] [YES] DATE SENT / / DATE WRITTEN ORDER RECEIVED / / DATE VERBAL ORDER RECEIVED (If Applicable) / /

E. PLAN APPROVED BY (Signatures & Titles) DATE / / PHONE NO.

F. PLAN HAS BEEN DISCUSSED AND ACCEPTED BY CLIENT AND/OR INFORMAL SUPPORTS [YES] [NO] EXPLAIN:

CLIENT SIGNATURE ____________________
(Or Conservator)
DATE / /

INFORMAL SUPPORT SIGNATURES DATE / /
DATE / /

APPENDIX 1.3

PATIENT/CLIENT ASSESSMENT TOOL FOR HOME CARE

INSTRUCTIONS

Draft 1

PATIENT/CLIENT ASSESSMENT TOOL FOR HOME CARE

(PATH)

INSTRUCTIONS

June 1986

Table of Contents

INSTRUCTIONS FOR COMPLETION OF
THE PATIENT ASSESSMENT TOOL FOR HOME CARE (PATH)

The PATH is to be completed on the long-term care client who has already been identified as having care needs which can be potentially met by community-based care/services. Completion of the PATH is an essential part of the process to determine if the client's potential for community based care is actually going to be successful. These services can cover the range of social and personal care to skilled medical services. They can be delivered by either family members or other informal supports or by formal service agencies and professional individuals.

The purpose of this instrument is to determine what services and care the client will need in order to function at the highest possible level within the community setting. Therefore, when completing the PATH assess the client's care needs in functional terms so that when services are planned they can be selected to help the client function maximally.

These instructions will first provide general concept information and then review the PATH question-by-question. In so doing, it will define terms, use examples and explain questions.

General Concepts

1. USING THESE INSTRUCTIONS - These instructions should be read before completing the PATH. These instructions should be kept with the PATH as the assessments are being completed. FREQUENT REFERENCE TO THESE INSTRUCTIONS WILL BE NEEDED TO ACCURATELY COMPLETE THE PATH.

2. MEASURING THE CLIENT'S STATUS - Clients fluctuate from day to day and even within the day. To determine at what level a client will be assessed, use the following four CRITERIA:

   - TIME PERIOD - Use the client's average status over the PAST 4 weeks (unless a question specifically uses a different time period) If the assessor's information about the client covers less than 4 weeks, use the lesser time period in assessment of the client on the PATH.

   - 60% RULE - Measure what the client generally does. By generally, we mean 60% or more of the time during the past 4 weeks or appropriate time period. If the client's care plan is or will be governed by what the client does a smaller percentage of time, base the assessment on the behavior influencing the plan of care.

- **CHANGE OF CONDITION RULE** - If the client has improved, or deteriorated, during the past 28 days and is expected to remain at the new level or continue to change in the same direction, record on the assessment instrument the response that best reflects the client's new functional status.

- **MEASURE WHAT THE CLIENT ACTUALLY DOES** - Measure actual client performance, not what the client <u>might</u> be able to do. This applies even when someone else performs a task that the client can do.

3. **OBSERVED VS. RECORDED** - If a record for the client is not consistent with the actual client status or the care being provied, use the actual rather than recorded.

4. **USE ONLY THE DEFINITIONS WITHIN THESE INSTRUCTIONS** - Different types of assessment instruments are used for specific reasons and often require different definitions. In all cases use the definitions supplied on the PATH or in this manual. Do not use definitions used on other assessment forms. Our ability to achieve consistency in assessment from assessor to assessor depends in large part on a common understanding of all the terms.

5. **CORRECTIONS** - Please cross out or white out any responses which you wish to change and reenter clearly in place of or close to the original response.

6. **EXAMPLES** - Examples given on the PATH and in this manual are just that -- examples. They are indicative of the types of conditions that pertain but are not to be taken as the only ones that apply.

7. **METHODS OF ANSWERING QUESTIONS** - Completion of questions having ranges of responses may be facilitated by beginning with the first descriptor if the client is relatively independent, and the last if the client tends to be heavily dependent. Those descriptors which are obviously not applicable to the client client should be eliminated immediately. Attention can then be focused on the remaining descriptors to determine which best describes the individual.

8. **APPLICABILITY TO NEW REFERALS** - The PATH is used to assess individuals who are entering the home care system for the first time, as well as clients known to the agency. All questions apply to both groups and should be answered on the basis of what will apply when home care services are provided to an initial referral.

9. **USE OF JUDGEMENT** - At times it may be difficult to choose between 2 responses to describe a client. When this is the case, use your best judgement to select the most appropriate response. <u>Do not leave the question blank.</u>

10. **CANNOT DETERMINE** - The response of "cannot determine" always refers to the client's condition interfering with the identification of a more descriptive response.

11. SOURCES OF INFORMATION - The information requested may be available from the client, informal supports, and/or available agency records (those of the completing agency and others).

Glossary of terms

CLIENT: an individual who is being considered for any of the range of long-term care/services based in the community.

ASSESSOR: a health/social care professional, usually a case manager with nursing or social work experience/education. This persons has knowledge of the long-term care service system and is able to evaluate the needs of long-term care clients. Specifically in this Manual, an assessor is a professional who is trained to complete the PATH, and is able to make the final decision whether the client can be cared for in the community. The assesor will likely work in a case management organization, where his/her responsibility is to decide upon and coordinate community care for clients.

COMMUNITY BASED CARE (CBC): Community-based Care are those services that are delivered in a non-institutional setting, congregate or private housing. These community-based services can be delivered to individuals in community sites (e.g. Adult Homes, Congregate Care) or at agencies delivering one or more services (e.g. Senior Nutrition Programs, Adult Day Services) or to individuals in their homes (e.g. Home Health Aid, Phyiscal Therapy, Meals-on-Wheels). CBC also includes the voluntary services/care contributed by family and friends of the client.

INFORMAL SUPPORTS/INFORMAL CAREGIVERS: the family members, friends, volunteeers, and neighbors who are able to participate in the client's care. These informal personnel are not paid and might live in the house with the client, or near enough to supply help. The level of care they can provide may range from minimal assistance and/or occasionally chore services or friendly visits, to complex care extending to several hours each day.

FORMAL SERVICES: the services that emanate from the various public, voluntary and private agencies and professional individuals that are purchased directly by the client or indirectly for a client through contract arrangements.

CERTIFIED HOME HEALTH AGENCY (CHHA): is a public or voluntary non-profit services agency which must provide, directly or through contract arrangement, at a minimum the following services to persons at home: therapeutic and preventitive nursing service, home health aid service, medical supplies and equipment suitable for use in the home and at least one additional service, such as physical therapy.

PERSONAL CARE SERVICES: includes services to assist with personal hygiene, dressing, feeding and household tasks essential to the patient's health.

HOMEMAKER SERVICES: provides assistance and instruction in managing and maintaining a household, dressing, feeding and incidental household tasks.

HOUSEKEEPER/CHORE SERVICES: includes light work or household tasks which do not require the services of a homemaker.

OCCUPATIONAL THERAPY SERVICE: This is a specialized service of treating a physical or emotional deficit by providing a specific task/modality to those individuals whose abilities to cope with daily living are threatened. The service is under the direction of a Registered Occupational Therapist who carries out a patient assessment and establishes a specific treatment program in accordance with medical direction.

Includes training to develop sufficient skills to carry out an occupation, perhaps different from the one in which the individual was trained prior to his illness.

PHYSICAL THERAPY SERVICE: This is a specialized service providing therapeutic treatment for a disease or injury by a physical means and exercise. The service is under the direction of a registered physical therapist who carries out a functional patient assessment and establishes a goal directed treatment program in accordance with medical prescription.

Manipulation of the extremities - training the use of the legs, arms or hands with the intent of restoring ambulation or full function to use of the feet, arms and hands.

SPEECH/HEARING THERAPY SERVICE: This is a specialized service to provide direct therapy to individuals with communication problems. The service is under the direction of a qualified speech therapist/pathologist who completes a patient evaluation and establishes a specific treatment program in accordance with medical direction.

Includes training in enunciation especially for persons who have had a stroke or surgery which makes speaking difficult.

RESPITE SERVICES: provision of infrequent and temporary substitute care or supervision of a frail or disable person on behalf of and in the absence of the caregiver, for the purpose of providing relief from the stresses or responsibilities concomitant with providing constant care, so as to enable the caregiver to maintain a normal routine. Respite may be provided by any service or combination of services supplied by individuals, social service districts, a public agency, residential care provider, a residential health care facility or certified home health agency.

CONGREGATE LIVING FACILITY: a facility that provides a stable, surrogate family living arrangement for adults. The level of functioning and amount/type of supervision varies.

ENRICHED HOUSING: a program that provides residents with assistance in meal preparation, shopping, housekeeping and personal care within a small group environment.

RESIDENTIAL CARE FACILITY (rcf): a facility licensed to provide only protective care. A residential setting wherein services are provided on a twenty-four hour basis, to persons who, though not requiring continual medical or nursing care are unable to live indenpendently and who need, in addition to room, board and housekeeping, either personal care or any other non-medical service. This includes Adult Homes (proprietary or not-for-profit) and family-type homes. These facilities are also called Adult Care Facilities (ACF) or Domiciliary Care Facilities (DCF or DOM).

LONG-TERM HOME HEALTH CARE PROGRAM (LTHHCP, also called "Nursing Home Without Walls"): is a coordinated plan of care and services provided at home to invalid, infirm or disabled persons who are medically eligible for placement in a hospital or residential health care facility (HCF). Services are provided by a certified home health agency, residential health care facility or hospital which has received certification an LTHHCP.

HEALTH RELATED FACILITY (hrf): a facility that provides some nursing supervision and minimal to moderate assistance with activities of daily living to ambulatory persons. HRFs also must provide coverage for medical services, pharmaceutical, and supporting services, social services, leisure time programs, dental and rehabilitation therapy services.

SKILLED NURSING FACILITY (SNF): a facility that provides 24-hour skilled nursing supervision for patients requiring rehabilitative or custodial care. SNFs must provide medical and nursing services, physical, occupational, speech, and hearing therapies, social services, dietary, dental, podiatric and pharmacy services as well as social activity programs.

RESIDENTIAL HEALTH CARE FACILITY: comprehensive term to include care provided in a skilled nursing facility (SNF) or health related facility (HRF).

SHORT-TERM ACUTE GENERAL HOSPITAL: a facility licensed as a hospital to provide diagnosis and treatment for patients with an acute illness or injury.

Global Assessment: This section was developed in order to allow Care Managers the opportunity to avoid completing an entire assessment instrument on patients requiring minimal and certain types of non-skilled nursing care. The option to use this section will be a policy decision determined by each individual agency.

SECTION I AGENCY IDENTIFICATION

This section should be modified to contain information appropriate for each agency's particular administrative recording needs.

SECTION II CLIENT DEMOGRAPHICS, NUMBERS AND INCOME

The information presented in this draft is provided as examples of possible data questions to be used in the administrative section. However, this section should be modified to contain information appropriate for each agency's particular administrative recording needs.

Instructions: All items must be filled in or lined through if not applicable. Most items in this section are self-explanatory; others requiring special explanation are numbered as they are on the form and explained as follows:

2. Usual Address: Specify client's home address, or where client will be living when he/she is to receive services. Print complete address, including apartment number and zip code.

3. I.D./ Case No.: Enter identification/case number that is used by the case management agency completing the assessment.

4. Client's Phone No.: Enter all phone numbers at which the client can be reached. Indicate the owner of the phone number if it does not belong to the client. If the client has no phone, state "None."

6. Date of Birth: State numerically, e.g. 11/04/83.

9-12. Insurances: Enter each of the client's insurances/coverage as they apply. Check official documentation of the numbers to assure privacy.

13. Income: Check all resources that apply.

SECTION III OTHER ADMINISTRATIVE DATA

Instructions: All information must be completed or lined through.

1. Date of Assmt.: Enter the date numerically (e.g. 11/04/83) that you, the assessor, have begun to fill out the PATH.

2. Reason for Path Completion: Select the one reason why the PATH is being completed.

   #1 Initial Assessment refers to a client utilizing Home Care Services for the first time.

#2 Reactivation of Services is indicated for a client not currently receiving services from the program but who has in the past.

#3 Reauthorization Assessment is selected for a client who is being evaluated according to the time period established by program policy for determination of the appropriateness of the current home care services for the client. It is also used when a comprehensive assessment has been requested to determine whether modification of current services is in order.

3. Primary reason for referral to home care: Enter the code for the one descriptor which best corresponds to the reason the client was most recently referred for home care. Choose only one reason. If more than one disability applies as the reason, choose the disability which is the most severe and requires the most care. The responses may be used to describe either physical or mental conditions, if applicable.

#1 Recent illness/trauma with hospitalization - no surgery.

#2 Recent illness/trauma with surgery - self-explanatory.

#3 Recent illness/trauma without surgery or hospialization - self-explanatory.

#4 Re-emergence of chronic illness with hospitalization - self-explanatory.

#5 Re-emerging of chronic illness without hospitalization - self-explanatory.

#6 Progressive deterioration of illness and/or general physical deterioration in functioning or capabilities of client.

#7 Reduced Mental Functioning - This refers to the individual whose intellectual capabilities are limited due to mental retardation or developmental disability.

#8 Psychosocial Dysfunction - Characteristics of the client other than those indicated by the other responses which necessitate home care. For instance, the individual is in an abusive situation, is unable to protect her/himself, or is an alcohol or drug abuser and therefore, requires home care services.

#9 Need to Supplement Informal Supports - The need for home care services arises because the informal support system does not or will no longer meet the client's needs rather than due to the client's condition.

#10 Other - Self-explanatory.

4. Living Arrangements: Identify type of housing client currently resides within. Possible answers include:

Private Residence
Special Housing - Elderly/Handicapped
Rented Rooms/Commercial
Adult Care Facility
Nursing Home (RHCF)
Psychiatric Hospital/In-patient
  Psychiatric Unit
Community Psychiatric Setting
Developmental Center
Community Developmental
  Disabilities Setting
Acute Hospital
Hospice
Shelter for Homeless

If this is different from where client lives on a more permanent basis and will be living more permanently under "usual," than also indicate type of "usual" housing. For example, if the client is temporarily living with a daughter while recovering from an operation, but will be moving back to own home after the period of recovery and will be receiving services in client's own home. The daughter's home would be "current". The client's home address would be "usual." In space given, specify address of current residence, if different from usual address.

6. Primary Contact Person: Print name, address, phone no. and work no. of person the client wishes to be contacted in case of emergency.

7. Continuing Care Physician or Provider (e.g. clinic): Print name, address, phone no. of physician who monitors client's health and provides health care services. If the cleint has no private physician, give name, address, phone no. of hospital or neighborhood clinic, HMO, where client usually receives care.

SECTION IV INFORMAL SUPPORTS AND HOUSEHOLD MEMBERS

Instructions: Unless otherwise stated, the questions in this section apply to the entire informal support system.

1. Household Composition: Please identify who the client lives with. Indicate all the choices that apply. Enter total number in the household. This information should be collected for the residence of the client where the client will be receiving formal services.

2. Primary Caregiver Traits: Skip to question 4 of this section if no informal supports are present, using the key, identify caregiver traits.

3. Informal Supports - Self-explanatory.

4. Family Involvement and Household Problems: Provide a brief narrative describing why client's family or household members are unable or unwilling to care for client.

SECTION V MEDICAL CONDITIONS

1. **Primary Medical Problem:**
List one (1) primary and one(1) secondary condition which, in your judgment, requires the most home care management. Use your professional judgment as needed. The condition may or may not be the same as indicated as the reason for referral or that identified by a physician. The PRIMARY CONDITION is the one causing the greatest problem for the client and requiring the most care. Enter the ICD-9 (International Classification of Disease-Revision 9) code for each condition. If the code for the primary condition cannot be found, clearly print the name of the diagnosis, abbreviated if necessary, in the space provided and leave the ICD-9 code blank.

2. **Other Care Factors - Diagnosis and Sensory Impairments:**

List those medical conditions (diagnosis and sensory impairments - see listing below, this list is not exhaustive) that affect the client's ability to function independently and would require care/services. Do not include those conditions which are manageable by the client. Diagnosis is any medically defined condition or disease that is associated with a disability, handicap or impairment for which the client has been admitted to or which necessitates continued stay for long term care at the time of this assessment. Sensory impairment is any impairment of hearing, sight or speech for which the client has not learned to compensate and which would affect the client's ability to function independently. For example, if the client is partially deaf and wears a hearing aid and can hear at a level that is functionally independent, do not include. Include also those sensory impairments or deficits for which the client has been unable or unwilling to compensate. For instance, the client may not be willing to wear glasses although legally blind, or may not accept partial blindness and may not be willing or able to accept training.

Other Care Factors - Diagnosis and Sensory Impairments

01 comatose
02 dehydration
03 diabetes mellitus
04 hemiplegia
05 ascites
06 amputation of limb
07 angina
08 brace/prosthetic limb
09 bleeding - internal (e.g. gastric)
10 contractures - lower body
11 contractures - upper body
12 dehydration - acute
13 diabetes mellitus
14 discoloration of extremity-long term
15 dyspnea
16 edema
17 edema-localized, nonpitting
18 edema-pitting
19 falls
20 gait disorder
21 internal bleeding
22 ostomy
23 quadriplegia
24 stasis ulcer
25 gait disorder
26 hemiplegia or paraplegia
27 hyper/hypoglycemic reaction
28 hypertension
29 musculoskeletal weakness-functional interference
30 pain
31 speech disorder
32 syncope
33 terminally ill
34 tracheostomy - requiring care
35 wound infection
36 blindness
37 deafness

Duration: Identify the appropriate code that is applicable to the length of time the client has been known to have each diagnosis or sensory impairment. If the client falls within the "Less than 3 month" category specify exactly what the duration is in terms of days.

Prognosis: For each condition specified, check the box which indicates the probable course and outcome of the condition using the appropriate code. Recover indicates that the client will gain a good state of health; Improve indicates that the client will reach a state that is better than the present state. It can be stated in the Care Plan whether the services/care are, therefore, only indicated as needed temporarily and that improvement might mean that in the near future the client could care for him/herself; or that the services needed currently could be diminished either by type or frequency as the client improves. Stable Self (client) Managed indicates that the condition is likely to remain the same (will not improve or worsen) but that the client is able to cope with or care for any problems that might be present as a result of the condition. For example, a diabetic who self administers his/her insulin and controls his/her diet. Stable Managed by Others indicates that while the condition is not likely to change, any care needs or problems present as a result of the condition must be managed by another person. For example, the client has been prescribed medications, but cannot remember when to take them him/herself. Someone must be there to manage the dispensing of the proper dosage at the right time. Deterioration indicates that the condition will worsen which may imply further care needs as time goes on.

Care Plan Narrative: In this section the assessor should indicate how each diagnosis or sensory impairment will functionally affect the care/services that will be required by the client. Assessor should indicate the type of skilled personnel necessary for meeting the client's care requirements; indicate how the diagnosis or sensory impairment affects the client's ability to function; how cooperative the client will be in accepting help; how able the client is to adapt to the problem(s); special problems or needs that are apparent in the situation: and/or will affect the types and hours of service planned. Indicate if in your opinion, further assessment is needed before a Care Plan narrative can be written. Also include any other special concerns or risks that may occur because of condition or impairment.

DEFINITIONS: Examples are for clarification purposes only, and are not intended to be all inclusive.

COMATOSE: Unconscious in that the patient is totally unresponsive to self and surrounding environment or semiconscious but unable to respond at all to own needs. At most, responds to powerful stimuli only. The coma must be present for at least 4 days. Examples of causes are brain insult, hepatic encephalopathy, acute diabetes and cardiovascular accident. Treatment examples are total ADL care, turning and positioning, parenteral feeding and monitoring vital signs.

DEHYDRATION - ACUTE: Excessive loss of body fluids requiring immediate medical treatment and ADL care. Fever, renal failure, acute pneumonia, acute urinary tract infection, and unstable diabetes are examples of causes. Examples of treatements are intake and output monitoring, electrolyte lab tests, parenteral hydration, and nasogastric feedings.

DIABETES MELLITUS - A metabolic disorder in which the ability to oxidize carbohyrates is compromised due to inadequate pancreatic activity resulting in disturbance of normal insulin production. Hypoglycemia or hyperglycemia may be a symptom of the diabetic condition but by itself does not constitute diabetes. Diabetes should be diagnosed by a physician.

BLEEDING - INTERNAL: Blood loss stemming from a subacute or chronic condition (e.g., gastrointestinal, respiratory or genito-urinary condition) which may result in low blood pressure and hemoglobin, pallor, dizziness, fatigue, and rapid respiration. Examples of causes include aneurysm rupture, gastrointestinal ulcer, acute diverticulitus, and carcinoma. Hemorrhoids are to be excluded. The care plan in the home may include monitoring of vital signs and monitoring for conditions arising as a complication of blood loss.

STASIS ULCER: Open lesion, usually in lower extremities, caused by decreased blood flow from chronic venous insufficiency. Examples of causes are severe edema, diabetes, and peripheral vascular disease. Examples of treatments are sterile dressing, compresses, leg elevation and whirlpool.

TERMINAL ILLNESS: Professional prognosis (judgement) is that patient is RAPIDLY deteriorating, and will likely die within 6 months. Examples of causes are end stage carcinoma, end stage renal, end stage Parkinson's, or end stage cardiac disease. Bedside ADL care, pain/analgesic therapy, oxygen, parenteral fluids, and social service support are examples of common treatments.

3. <u>Pertinent Hospitalizations/Out Patient Treatments</u>:

Please indicate the reason and specific procedure associated with either a client's recent hospitalization or out patient treatment. Describe the effects of the hospitalization treatment if the Care Plan is affected.

SECTION VI PSYCHO-BEHAVIORAL CONDITION

Instructions:
For each of the questions, assess the severity and frequency of the behavior as exhibited with behavior modification and treatment plans in effect.

- FLUCTUATING CONDITON: If the client's status fluctuates to the extent that two or more answers can be applicable for a question, choose the answer that reflects the status of the client 60% or more of time during the last 28 days prior to this assessment unless a smaller percentage determines the care plan.

- CHANGE OF CONDITION RULE: If the client's status has deteriorated or improved during the last 28 days and is judged to stay at this level or proceed in this direction, then answer the question on the basis of the client's current functional status.

- ORIGIN OF CONDITION: When measuring the client's condition, do not consider the origin of this disability, i.e., physical, mental and/or social problems. The concern for measurement is what the client's condition is.

- BEST DESCRIPTOR: Even though information about the client may be limited, all questions should be answered using the best descriptor, in the opinion of the assessor, for the client.

DEFINITIONS

- ACTIVE TREATMENT PLAN: Must be in current use for the behavior problem but may be implemented in home care or elsewhere.

- PSYCHIATRIC ASSESSMENT: Evaluation by a recognized professional with psychiatric training/education which supports that the client has a severe behavioral problem of the type described in the question and which is still clinically valid for that problem.

- DISRUPTIVE: Through verbal and/or physical actions, the client interferes with others. This interference requires immediate attention to control the situation. Without intervention, the disruption would persist or a problem would occur.

- UNPREDICTABLE BEHAVIOR: The caregiver cannot foretell when, or under what circumstances the client will exhibit the behavioral problem since there is no evident pattern.

- PREDICTABLE BEHAVIOR: Based on observations, and experience with the client, the caregiver can discern when a client will exhibit the behavioral problem and plan appropriate responses in advance. The behavioral problem may occur during ADL routines (e.g., bathing), specific treatments (e.g., contracture care, ambulation exercises) or for a logical reason, such as being wrongly criticized, bumped into, etc.

- **VERBAL DISRUPTION:** Exclude verbal outbursts/expressions which do not create disruption as defined.

- **PHYSICAL AGGRESSION:** The behavior must meet the qualifier "with intent for injury".

- **DISRUPTIVE INFANTILE OR SOCIALLY INAPPROPRIATE BEHAVIOR:** The behavior must be physical and create disruption. Exclude: verbal outbursts, social withdrawal, hoarding, and paranoia.

- **HALLUCINATIONS:** Client sees, hears, feels, smells or tastes things which have no basis in external reality. Do not include misperceptions that occur during sleeping or between sleeping and awakening (hynagogic). Exclude delusions. The assessor should observe the client's body language and choice of words to determine whether the client is actually sensing the experience (hallucinating) or thinking it exists (delusional). The cause of the halluncinations can be physical (e.g., dehydration, bleeding, terminal illness) or psycholgical (e.g., schizophrenia).

SECTION VII - PSYCHO-SOCIAL CONDITION

Instructions: Check all sources for information that apply. Answer all questions in this section, including Care Plan. This section evaluates the client's attitudes that other sections of the PATH may not directly capture. The answers to these two questions can directly determine how able the client is to respond to help, to participate or be willing to participate in his/her own care needs. Choose your answers according to how much the client's psycho-social status affects his/her level of functioning and willingness to accept services/care.

1. Emotional Strength & Motivation: Evaluate to what extent the client wants to stay in the community and participate in his/her own care. Evaluate also how realistic the client's own assesment is of his/her needs and situation, as well as the degree to which the client has developed or is developing coping mechanisms. These coping mechanisms can be either internal coping mechanisms in the form of motivation and inner ability to deal realistically with the condition(s) and situation(s), such as the ability to live alone without socially isolating him/herself, comply with health care regime and cope with short-term changes/stresses, or external coping mechanisms such as creating relationships with friends, social clubs, pets, family members. Check the box that most accurately represents the client's attitude.

   Care Plan Narrative: The assessor should evaluate whether a service could be provided that could help strenghten and/or change the client's emotional attitude, as well as how the current emotional attitude will help determine the kind of services that will be required. Evaluate also what strengths and coping mechanisms should be kept in tact.

2. Stressful Life Events During Past Year: Examples of such events are provided on the PATH. Check yes if any of these, or others, have occurred and specify what they were.

   Care Plan Narrative: Describe how these events, if any, affect the client's functioning and care needs.

SECTION VIII ACTIVITIES OF DAILY LIVING(ADL)

Instructions: Check all sources for information that apply. Answer all questions in this section including Care Planning. Use the following qualifiers in answering each ADL question:

> **Time Period** - Past four weeks.
> **Frequency** - Assess how the client completed each ADL 60% or more of time it was performed (since ADL status may fluctuate during the day or over the past four weeks).
>
> **CHANGED CONDITION RULE:** When a client's ADL has improved or deteriorated during the past four weeks and this course is unlikely to change, measure the ADL according to its status during the past seven days.

1-7. Check all sources for information that apply. The ADLs are those basic functions that people must be able to do to take care of themselves on a daily basis. Evaluate the degree to which the client can function independently-with or without an adaptive device-or the degree to which the client needs help to complete each ADL 60% or more of the time it was performed. For each ADL question 4 or 5 functional levels are provided to choose from. Select the most accurate level and enter its number to the right in the box provided. If the client is not able to perform any specific activity alone, carefully consider whether the help that is required can be that of a family member of friend (INFORMAL SUPPORT), or needs to be that of a professional or a service from an agency (FORMAL SERVICE). A formal service might only be necessary at the begining to train either the client or the informal caregiver. The formal service might be needed on an on-going basis to monitor or deliver the care. Be sure to state the name of the informal caregiver, if that is your choice, and the specific days/hours the person is required. If a formal service, or professional, is required, be sure to check the specific reason, i.e. "to train the client", "to monitor the activity", and indicate the specific hours needed. Assess carefully if the care can be done by an informal caregiver rather than a formal service. However, if the client has no informal supports, check the help required under the formal services.

10. Rehab Goals: Consider whether the degree to which the client can do the activity is a temporary condition or whether it is longer term. For example, a client might need total assistance with bathing because he/she is recovering from an operation or broken limb, but the level of assistance would diminish as the client recovers. Indicate under REHAB. GOALS whether the current situation is temporary and, if so, how much the client can be trained to perform the ADL, or will improve. The goal is to allow for the client being as independent, as possible.

- Equipment: Specify the client's present use of equipment or the new equipment that will have to be used by the client. Indicate whether the client will have to be taught how to use it.

General definitions:

Intermittent: A provider does not have to be present during the entire activity.

Supervision: Verbal encouragement and observation, not physical hands-on care is provided to client.

Assistance: Physical hands-on care is provided to client.

Continual: One to one care is provided to clients if a provider is not present, the client will not complete the activity.

Incontinent: 60% or more of the time the client loses control of his/her bowel or bladder functions with or without equipment.

Definitions of Activities: This is a description of a client's usual performance of the activity. Usual means more often than not.

1. **Eating:** The process of getting food by any means from the receptacle (plate, cup, etc.) into the body and to swallow the food served.

2. **Mobility:** how the client moves about from place to place with adaptive equipment; wheelchair; or by his/her self.

3. **Transfer:** The process of moving between the bed and chair, or wheelchair.

4. **Bathing:** To wash the body or body parts, whether tub, shower, or basin, including getting to the bath, obtaining the bath water, or getting into the tub or shower.

5. **Personal Hygiene:** the process of grooming, including combing hair, washing face, shaving and brushing teeth.

6. **Dressing:** Putting on, fastening and taking off all items of clothing (including braces or artificial limbs worn daily) and obtaining and replacing these items in their usual storage places.

7. **Toileting:** Getting to and from the toilet, transferring on and off the toilet (commode, bedpan), cleaning self after elimination, and adjusting clothing.

SECTION IX INSTRUMENTAL ACTIVITIES OF DAILY LIVING (IADL'S)

Instructions: ⌐1-9 Check all sources for information. These activities are similar to the ADLs, only cover a broader area of activity beyond personal care. Indicate the degree to which the client can do each activity, according to the ACTIVITY STATUS KEY and put the number in the box to the right of the question. As with the ADLs in the PATH Section, if the client cannot perfc m these items alone, indicate whether the assistance can be by a family member or friend (INFORMAL SUPPORTS) or by a professional or agency service (FORMAL SERVICE). Add under the COMMENTS column any specific limitations there might be for each activity. Follow the instructions under Section VIII(ADL) for Rehab goals (qt.8) and equipment (qt.9).

Activity Status Key Definitions:

On the face of the page each of the Community Activitie are measured by one general Activity Status key. To help understand what an Activity Status number 1,2 and 3 means in functional terms for each activity, definitions are provided here.

1. Get to places out of walking ability
Status #1 Able to drive or use public transportation independently.
#2 Needs help in and out of vehicle, someone else must provide transportation.
#3 Must have someone else take care of all needs necessary for transportation, i.e. dressing and transferring into vehicle or does not leave home.

2.a. Prepare Light Meals
Status #1 Able to plan and prepare all meals for self.
#2 Able to fix light meals (e.g. cereal, sandwich) or reheat but not on a regular basis.
#3 Unable to prepare any meals, even reheat.

2.b. Prepare and Cook Meals
Status #1 Able to plan and prepare all meals for self.
#2 Able to fix main meals but not on a regular basis.
#3 Unable to prepare main meal.

3. Do housework/Cleaning
Status #1 Able to perform almost all household tasks-light and heavy work.
#2 Able to perform light housework (e.g. dusting, dishes, trash disposal).
Cannot do most heavy housework (e.g. vacuuming, washing floors, cleaning kitchen).
#3 Unable or unwilling to do any housework.

4. Laundry
Status #1 Able to take care of all laundry and can access laundry facilities.
#2 Able to do light laundry, such as minor hand wash or light washer loads.
NEEDS help with heavy laundry such as accessing laundry facility, carrying large loads of laundry or supervision.
#3 Unable to do any laundry physically or needs continual supervision and assistance, (if confused or judgment impaired).

5. Shopping

Status #1 Able to go by self and take care of shopping, including carrying packages.

#2 Able to go by self to shop, but needs someone to carry packages.

o Able to do by self only light shopping and carry small packages, but needs someone to do occasional major shopping.

o Unable to go shopping alone, but can go with someone to assist.

#3 Needs someone to do all shopping and errands.

6. Use Telephone (Regardless if Has a Telephone)

Status #1 Able to look up phone numbers, dial number and receive phone calls.

#2 o Able to use the phone as needed, but needs some help to get to the phone.

o Able to use phone with assistance and/or supervision (look up numbers, dialing).

#3 Unable to use phone.

7. Handle Personal Business/Finances

Status #1 Able to pay bills (on time and for correct amount), balance checkbook/handle bank account and make contracts independently.

#2 o May need to be reminded to pay bills or take care of other personal business.

o May need assistance in getting materials needed (e.g. checkbook, stamps) or assistance in writing checks, letters, and balancing checkbook.

o May need assistance or guidance in handling financial matters (home mortgage, investments).

#3 Needs someone to write checks, pay bills and handle personal business. Client does not participate.

Definition of Activities:

1. Get to Places out of Walking Ability: To take transportation (bus, car, subway) to go to a place further than client can walk. In order to do this, it implies that the client would know the directions for getting to his/her destination and would know how to use transportation, e.g. if a client wanted to visit a friend, the client would know where the friend lives and be able to know which bus to take to get there. The client would also have to be able to walk (with or without aids) to the bus and from the bus to the friend's house.

2.a. Prepare Light Meals: To be able to prepare light meals,(e.g. cereal, sandwich) or reheat but not main meal on a regular basis.

2.b. **Prepare/Cook Meals:** To be able to chop, cut, measure foods to prepare a recipe, to be able to use the stove and/or overn, to know how long food should cook to be edible, to be able to lift and move pots and pans, to be able to boil water, etc.

3. **Do Housework/Cleaning:** To be able to dust, sweep, wash dishes, vaccum, move small pieces of furniture to clean, rinse out bath -- to handle the normal range of housekeeping chores.

4. **Do Laundry:** To carry laundry to and from washing machine, to use washer and dryer, to wash small items by hand.

5. **Do Shopping:** To select and purchase items in a store (groceries, clothes, drugs, etc.) and to carry them home or be able to have them sent.

6. **Use telephone:** To be able to use phonebook or know numbers of parties desired to be reached, to literally be able to dial and use telephone.

7. **Handle Personal Business/Finances:** To be able to understand how to pay bills, to balance a checkbook, to keep accounts, to answer correspondence and to be able to write and to keep track of when to pay which bills. To handle money, understand the cost of items and to count change.

SECTION X MEDICATIONS

Instructions: Check all sources for information that apply. Make sure that your information is current. Assessor should check with client's physician, if client has one .

1. **Current Medications:** List all prescribed and over-the-counter.
   Dose: For each medication listed print the quantity and the intervals it is to be taken.
   Route: State the way the medication is given (e.g. oral, injection, suppositories, intravenous, etc.)
   Frequency: State number of times medication is to be taken per day, week or as needed.
   Need to be Met By: Evaluate whether the client is able to take each medication by self. If not, for each one, indicate whether a family member or friend (INFORMAL SUPPORT) can assist in giving the medication, or whether a professional/agency service (FORMAL SERVICE) is necessary. If assistance can be given by an informal support, print name of person and specific days/hours the person will assist the client. If the client has no informal supports, or if a professional is needed, check the kind of assistance needed and print the specific days/hours the service is needed.
   Allergies/Sensitivities: State all known medications to which client is allergic. Specify any alternative medications that can be used or preventative procedures that are, or can be used. State sensitivities to medications taken by the client currently.

2. **How Does Client Obtain Medication:**
   Briefly explain whether client can get own medications (refill prescriptions), whether it can be done by an informal caregiver, whether pharmacy can delivery, or whether a formal service must supply specific or all medications. Also include the **NAME OF PHARMACY AND PHONE NUMBER:** Print the name, address and phone number of the pharmacy used by the client for prescriptions and other drug/personal items.

3. **Comments:** Explain any side effects of current medications or ones taken previously, such as during a recent hospitalization. Indicate if client has a history of non-compliance or abuse of specific medications or with all medications.

- **PSYCHOTHERAPY SERVICES:** A specialized service to evaluate, treat and monitor the mental health of an individual. This service is provided by a licensed physchologist or psychiatrist and not a psychiatric/mental health nurse or a psychiatric social worker.

- **MENTAL HEALTH THERAPY BY MSW OR PSYCHIATRIC NURSE (MSRN):** Specialist must have mental health training/education. The service provided consists of evaluation, treatment, and monitoring of the mental health of the client.

- **SOCIAL SERVICES:** Exclude visits for the sole purpose of initial home care assessment or reauthorization. Consultations may be to counsel, provide information, make referrals or act as an intermediary.

- **INHALATION THERAPY SERVICES:** A specialized service to administer and/or teach the techniques or use of equipment to increase pulmonary capacity, liquify secretions and/or facilitate the exchange of gasses at the alveolar level. The service is under the direction of a licensed inhalation therapist.

SECTION XI SERVICES/TREATMENTS

Instructions: Check all sources for information that apply. Assessor should check with client's physician, if client has one.
Treatment: (Questions 1). Indicate each of the skilled or non-skilled treatments the client requires.
Frequency: Print the number of times each day or week the treatment is needed. If the client needs further evaluation to state the number of treatment times, print "eval."
Need to be Met By: Follow the instruction format of the previous 3 PATH Sections: Check for each treatment whether the client can perform it him/herself. If not evaluate whether it can be performed by a family member or friend (INFORMAL SUPPORT) or necessitates a professional or agency service (FORMAL SERVICE). If it can be completed by an informal support print name of person and specific days/hours person is available. If there are no informal supports or if a professional/agency service is necessary, indicate how that person is to help in the proper box. Specify the number of days/hours service is required. Under COMMENTS, provide details of client's condition (e.g. cause for and location of skin problems, limits of motion) type of treatment (e.g. motion exercises, etc.) and complications with treatment. To answer yes for any of these medical treatments, the following qualifiers must be met:

TIME PERIOD: The number of treatments which will be provided by each provider during the week following the PATH assessment must be recorded. Only the PATH reassessment will indicate the treatments performed the previous week. If your agency's home care is not yet provided, indicate the number of treatments per week which are planned for the client.

DOCUMENTATION: Physician order specifies that the treatment should be given.

DEFINITIONS:

CATHETER: Treatment of catheter (indwelling or external) including insertion, cleaning, and emptying.

DECUBITUS LEVEL: Enter the level of skin breakdown (located at pressure points) using the qualifiers stated below:

> **Documentation** - For a patient to be coded as level 4, documentation by a licensed clinician must exist which describes the following three components:
> - o A description of the patient's decubitus.
> - o Circumstances or medical condition which led to the decubitus.
> - o The active treatment plan.

Levels:
- #0 No reddend skin or breakdown.
- #1 Reddened skin, potential breakdown.
- #2 Blushed skin, dusty colored, superficial layer of broken or blistered skin.
- #3 Subcutaneous skin is broken down.
- #4 Necrotic breakdown of skin and subcutaneous tissue which may involve muscle, fascia and bone.
- #5 Patient is at level 4, but the documentation qualifier has not been met.

DIALYSIS: The process of separating components, as in kidney dialysis (for example, renal failures, leukemia, blood dyscrasia). (Patient may have to go to a hospital for treatment.)

NASOGASTRIC FEEDING: The client is fed through the use of a tube inserted through the nasal passage to the stomach for feeding. This is used when patient is unable to take food orally or refuses to eat.

NURSE MONITORING: - if not monitored closely 2X/wk patients condition will become unstable and/or deteriorate, monitor or compliance of diet, vital signs, wound site, meds - (lifesaving meds) i.e.,

1. cardiac
2 diuretics
3. cortiosteriods
4. insulin
5. anticoagulants

RANGE OF MOTION: Process of moving a joint through the highest and lowest fields of mobility by either active or passive means.

RESPIRATORY CARE/OXYGEN THERAPY: Care for any portion of the respiratory tract, especially the lungs for such conditions as COPD, pneumonia, emphyseema. The care may include one or more of the following: percussion, suctioning, postural drainage, positive pressure machine, possible oxygen to administer drugs. The administration of oxygen by nasal catheter, mask (nasal or oronasal), funnel or cone, or oxygen tent for treatment of conditions resulting from oxygen deficiency, e.g., cardiopulmonary condition.

SUCTIONING--GENERAL: Mechanical techniques for clearing away fluid or secretions from the nose, mouth or nasopharyngeal cavity.

TRANSFUSIONS: Introduction of whole blood or blood components directly into the blood stream. (Patient may have to go to a hospital for treatment.)

WOUND CARE: the application of sterile dressings to a wound resulting from trauma, surgery or open cancerous lesion frequency of care determined "as needed" to keep wound clean during the healing process. Duration of care must necessitate at least three weeks of care determined by the condition of the wound (e.g. circumference, depth).

2. **Referrals to:** (Question A-D). Refers to the client's need for further assessment by a specialist, or for the referral for new services already determined, or to indicate what special therapies or treatment the client is already receiving. Check the appropriate box. Under COMMENTS briefly describe for each item why the client needs evaluation/treatment or is receiving service. Indicate expected prognosis.

   To answer yes for any of these referrals, the following qualifiers must be met:

   The services listed are services provided directly by specialized professionals, not regular nursing staff. Include rehabilitation nurses in answering this question. This question refers to specialized professionals who are hired or are consultants to the Home Care Agency for whom the client is being assessed. They may provide services to the client in the home or elsewhere. Services by

specialized professionals from other agencies whether home care or not, should not be included.

Include-only licensed professionals. Include certified therapy assistants (e.g., physical therapy assistant) only if they are supervised by a registered therapist employed by the Home Care Agency. Exclude therapy aides.

If therapy is provided to more than one client simultaneously, the time indicated on the PATH should be the time therapy is provided by the number of clients participating.

PHYSICAL THERAPY SERVICES: Include only if the servie is under the direction of a Registered Physical Therapist and the client has a goal-directed treatment program.

OCCUPATIONAL THERAPY SERVICES: Include the service only if it is under the direction of a Registered Occupational Therapist who carries out a client assessment and establishes a specific treatment program in accordance with medical direction.

SPEECH THERAPY SERVICES: Include the service only if it is under the direction of a licensed speech therapist/pathologist who does a client evaluation and establishes a specific treatment program in accordance with medical direction.

SECTION XII SPECIALIZED SERVICES

- The services listed are services provided directly by specialized professionals, not regular nursing staff. Include rehabilitation nurses in answering this question.

- This question refers to specialized professionals who are hired or are consultants to the Home Care Agency for whom the client is being assessed. They may provide services to the client in the home or elsewhere. Services by specialized professionals from other agencies whether home care or not, should not be included.

- Include only licensed professionals. Include certified therapy assistants (e.g., physical therapy assistant) only if they are supervised by a registered therapist employed by the Home Care Agency. Exclude therapy aides.

- If therapy is provided to more than one client simultaneously, the time indicated on the PATH should be the time therapy is provided divided by the number of clients participating.

DEFINITIONS

- IMPROVE: Refers to a realistic expectation that the client's condition will improve significantly within a reasonable (and generally predictable) period of time.

- STABILIZE: Refers to a determination by the therapist that a client has no potential for improvement and will regress without intervention. The therapist is only responsible for designing and supervising a program to retain the client's existing level of function. The actual maintenance therapy may be provided by the nursing staff.

- AVERAGE NUMBER OF HOURS PER WEEK and AVERAGE TOTAL TIME IN HOURS PER WEEK: Calculate the average number over the last 4 weeks. Round the average to the nearest whole number. Do not enter fractions or decimals in the space provided. If the service is not yet provided but is authorized, enter the authorized time.

- PHYSICAL THERAPY SERVICES: Include only if the service is under the direction of a Registered Physical Therapist and the client has a goal-directed treatment program.

- **OCCUPATIONAL THERAPY SERVICES:** Include the service only if it is under the direction of a Registered Occupational Therapist who carries out a client assessment and establishes a specific treatment program in accordance with medical direction.

- **SPEECH THERAPY SERVICES:** Include the service only if it is under the direction of a licensed speech therapist/pathologist who does a client evaluation and establishes a specific treatment program in accordance with medical direction.

Although not specifically enumerated on the PATH, other therapy services which the client may be receiving, include those below:

- **PSYCHOTHERAPY SERVICES:** A specialized service to evaluate, treat and monitor the mental health of an individual. This service is provided by a licensed physchologist or psychiatrist and not a psychiatric/mental health nurse or a psychiatric social worker.

- **MENTAL HEALTH THERAPY BY MSW OR PSYCHIATRIC NURSE (MSRN):** Specialist must have mental health training/education. The service provided consists of evaluation, treatment, and monitoring of the mental health of the client.

- **SOCIAL SERVICES:** Exclude visits for the sole purpose of initial home care assessment or reauthorization. Consultations may be to counsel, provide information, make referrals or act as an intermediary.

- **INHALATION THERAPY SERVICES:** A specialized service to administer and/or teach the techniques or use of equipment to increase pulmonary capacity, liquify secretions and/or facilitate the exchange of gasses at the alveolar level. The service is under the direction of a licensed inhalation therapist.

SECTION XIII PHYSICAL HOME ASSESSMENT

Instructions: Indicate all sources for information that apply. Print date of home visit, if on site assessment was made. If client has no home, check box, and go straight to CARE PLAN. If the client has a home or is living in a home that is not suitable for the client's current condition, modifications will have to be made. If the environment presents too many risks that cannot be modified, other living arrangements will have to be made. If possible, personally make a home visit before completing this section.

Physical Condition: Check whether each condition listed is a problem or not. If the problem may exist, but assessor has not been to the home, print "eval." in or next to the YES box. This indicates that it may require on-site evaluation. Specify all other problems in the home under OTHER PROBLEMS that might provide a risk to the client. The conditions listed are defined as:

1. **Doorway Widths:** Doorways that are not wide enough to accommodate a wheelchair or other special equipment.

2. **Fixture Heights/Reaches:** Fixtures should be at a height that is comfortable and/or possible for the client to reach. For example, if a client is in a wheelchair, fixtures might have to be lowered or if a client is bedridden and cannot reach a wall switch, a new arrangement such as extension cords or new lights may be needed.

3. **Stairs:** Evaluate whether stairs inside client's home prevents the client's mobility to different rooms. Evaluate whether stairs to outside of client's home prevent client from entering and leaving home. Stairs should be firm and strong and may need strong railings.

4. **Readily Discernable Hazards:** Any hazard that could be dangerous to the client's health and safety at home, such as those listed with the question on the face of the PATH.

5. **Safety Habitability/Safety:** Those hazards/situations that may cause problems to client or providers' health/safety, such as the lack of certain facilities, such as a stove, telephone, proper amount of heat, filth, etc.

6. **Other Problems:** Should indicate all changes that must be made to accommodate client's current condition. For example, a commode installed and bath arrangement made downstairs if the only house bathroom is upstairs and the client cannot climb stairs; the installation of a bed downstairs; or bed with rails because the client needs the protection at night.

Need to be Met By: Check all boxes that apply to how problem can be remedied.

Care Plan Narrative: Also include further information on how the problem will be corrected, such as specific Informal Support or Formal Service needed.

SECTION XIV CARE PLAN SUMMARY

Instructions: The Care Plan Summary indicates the actual plan of care and services the client requires, and who is going to furnish those services and care. Included in the service package is the consideration of the client's payment sources versus the estimated cost of the service package. This page aggregates the key information from pages 1 of the instrument. On those pages the assessor has specified (1) the client's needs, (2) the client's situation -- informal supports and home environment, (3) how those needs could best be met, and (4) the implications they have for the Care Plan. Heading: Complete the heading information on top of page except for the Section on the right side (i.e. REFERRED TO and NEXT ASSESSMENT IN), which are answered after Care Plan is completed, when the source of the formal servies is determined.

A. CAREPLAN COLUMNS:

Problem: Only specify those problems for which some type of service/care is indicated. Do not list those which the client can for him/herself or client has learned to compensate for.

Note:

- State these problems in functional terms, e.g. "cannot do," "has difficulty with."

- Provide the reason for each problem. These statements are important because they can imply root cause or different service requirements. For example "cannot cook" might be due to the lack of sight, or because the client has no stove or does not know how to cook.

- Group together in each box provided all problems that are similar or have the same root cause or reason, and might be met by the same service. For example, the client cannot do household chores and shopping because he or she is blind; client cannot perform bathing, dressing, toileting due to limited mobility caused by a broken hip. Be specific and brief.

- Desired Outcome: State outcome desired by both client and assessor. Be specific about what the outcome and provide a time frame. State in functional terms. For example if need is "difficulty with bed to chair transfer because of hip cast," the desired outcome might be independent transfer with equipment in three weeks.

- Need to be Met By: State name, address, phone number of actual provider or program - whether informal support or formal service. The type of formal providers will vary according to the county the assessment is being made, but can include the Personal Care Program, Public Health Nursing, Adult Homes, Meals-on-Wheels, counseling services, friendly visitors, telephone reassurances, or all other formal services available in the county. It will be necessary for the assessor/care planner to be creative, to know the community well, and also explore alternative ways to combine services or combine services and informal supports to meet the client's needs.

Estimated Units: State number of hours, time (AM,PM, night) and days required by formal and/or informal supports.

Start Date: State day; month, year service/care is to begin.

Payment Source: Enter source(s) of payment used to pay for service/care required by the client's problem (e.g. Medicare, Medicaid, private insurance, client self pay, family/private sources).

Estimated Cost: Estimate the cost for each unit of service to meet the needs of each problem or problem group specified. At the end of the column indicate cost of physician visits and medication and equipment purchased. Then provide a total of all costs. If Informal Supports are meeting a problem, and no Formal Services are needed, draw a line through Estimated Cost as non-applicable for that problem.

Comments: Print any new or additional information that might be helpful for determining the Care Plan, e.g. prognosis, financial, service complications, etc. Specific exceptions to Service Options.

B. Unavailable Service: Print if a service required is not available and what difficulty it causes for putting together the CARE PLAN. Indicate if any alternative arrangement is possible. Indicate whether it was the type of service which was lacking or whether or not enough hours or days the service needed was available.

C. Waiting List: If the client is on the waiting list for a service listed in Section A, provide the name of the service, agency, provider and the date the client was placed on the waiting list.

D. Physician Statement/Orders: If physician orders are required for client, provide date orders were sent and date orders were received. If orders were phoned in, provide that date.

E. Plan Approved: Enter signatures, title, date of all persons who approved the Care Plan. The person who prepared Care Plan should enter name at top of form.

F. Plan Discussed and Accepted: Check whether client and/or informal supports accepted Care Plan. If not, explain why not.

SIGNATURES: Client (or conservator) and informal supports should sign and date Care Plan. These signatures should indicate that they are thoroughly cognizant of Care Plan and their responsibility for their participation in the care/services of the client.

APPENDIX 1.4

Classification Instrument

for

Home Care

. DRAFT

CLASSIFICATION INSTRUMENT FOR HOME CARE (CIH)

SECTION I ADMINISTRATIVE DATA

1. AGENCY NAME ______________________________
2. STATE IDENTIFICATION NO. ____________________
3. CLIENT NAME (Last-First-M.I.) Please Print
4. SEX ____
   1. Male   2. Female
5. DATE OF BIRTH __ __ /__ __ / __ __ __ __
6. S.S. NO. __ __ __ / __ __ / __ __ __
7. MEDICAID NO.   Expiration Date
   ____________   / /
8. MEDICARE   A   B
9. DATE OF ASSMT. __ __ /. __ / __ __ __ __
10. REASON FOR CIH COMPLETION _
    1= Initial Assessment
    2= Reactivation of Services
    3= Reauthorization Assessment
    4= Other

SECTION II MEDICAL EVENTS

11. Decubitus level: Enter the most severe level (0-5) ___

12. Medical conditions: During the past four weeks.

1= Yes   2= No

A. Comatose............_____
B. Dehydration.........._____
C. Internal Bleeding..._____
D. Stasis Ulcer........_____
E. Terminally Ill......_____
F. Hemiplegia.........._____

13. Medical Treatments:
    Key: 1= Yes   2= No

A. Catheter insertion/care......_____
B. Dialysis...................._____
C. Intravenous injection
   (at least 3 times per day)..._____
D. Medication Administration...._____
E. Nasogastric feeding.........._____
F. Nurse monitoring............._____
G. Parenteral feeding..........._____
H. Ostomy care.................._____
I. Range of motion.............._____
J. Respiratory Care............._____
K. Suctioning..................._____
L. Tracheostomy care............_____
M. Transfusions................._____
N. Wound Care..................._____

SECTION III ACTIVITIES OF DAILY LIVIVING (ADLs)
Answer questions 14-17 according to how each task was completed 60% of the time during the past four weeks.

14. EATING: PROCESS OF GETTING FOOD BY ANY MEANS FROM THE RECEPTACLE INTO THE BODY (FOR EXAMPLE, PLATE, CUP, TUBE). ____

1= Feeds self without supervision or physical assistance. May use adaptive equipment.

2= Requires *intermittent* supervision (that is, verbal encouragement/guidance) and/or minimal physical assistance with minor parts of eating, such as cutting food, buttering bread or opening milk carton.

3= Requires continual help (encouragement/teaching/ physical assistance) with eating or meal will not be completed.

4= Totally fed by hand: client does not manually participate.

5= Tube or parenteral feeding for primary intake of food. (*Not* just for supplemental nourishments.

15. TRANSFER: PROCESS OF MOVING BETWEEN POSITIONS, TO/FROM BED, CHAIR, STANDING, (EXCLUDE TRANSFERS TO/FROM BATH AND TOILET). ____

1= Requires no supervision or physical assistance to complete necessary transfers. May use equipment, such as railings, trapeze.

2= Requires *intermittent* supervision (that is, verbal cueing, guidance) and/or physical assistance for difficult maneuvers only.

3= Requires one person to provide constant guidance, steadiness and/or physical assistance. Patient participates in transfer.

4= Requires lifting equipment and one person to provide constant supervision and/ or physically lift.

5= Cannot and is not gotten out of bed.

16. BATHING: PROCESS OF WASHING BODY PARTS, INCLUDING GETTING TO THE BATHING WATER. THIS MAY INCLUDE THE SHOWER, BATHTUB, OR BED BATH. _____

1= Requires no human supervision or support. May use adaptive equipment.

2= Requires intermittent checking and observing. May require assistance for minor parts of the task, transferring in and out of the bath and bathing back.

3= Requires continual help (supervision or physical assistance) with most parts of bathing.

4= Client does not participate. Client is bathed in bath, shower or bed by another person.

17. TOILETING: PROCESS OF GETTING TO AND FROM TOILET (OR USE OF OTHER TOILETING EQUIPMENT, SUCH AS BEDPAN), TRANSFERRING AND OFF TOILET, CLEANSING SELF AFTER ELIMINATION AND ADJUSTING CLOTHES. _____

1= Requires no supervision or physical assistance. May require special equipment, such as a raised toilet or grab bars.

2= Requires *intermittent* supervision for safety or encouragement; or *minor* physical assistance (for example, clothes adjustment or washing hands).

3= Continent of bowel and bladder. Requires constant supervision and/or physical assistance with major/all parts of task including applicances (i.e., colostomy, ileostomy, urinary catheter).

4= Incontinent of bowel and/ or bladder, and is not taken to a toilet.

5= Incontinent of bowel and/or bladder, but is taken to a toilet every two to four hours during the day and as needed at night.

SECTION IV INSTRUMENTAL ACTIVITIES OF DAILY LIVING (IADLs)
Answer questions 18-19 according to how each activity was completed 60% of the time during the past four weeks.

ACTIVITY STATUS:
1. Totally able (with or without equipment)
2. Limited, participates but does not complete task fully
3. Unable to participate at all.
4. Totally unwilling to perform.

ACTIVITY (What client can do):

18. MEAL PREPARATION
Prepare light meals/reheats meals ____
Prepares and cooks meals ____

19. SHOPPING ____

SECTION V. BEHAVIORS
Frequency Code for Question 20 and 21:
Condition Status:
1. NO/MINIMAL PROBLEM - Little/No effect on CARE PLAN.
2. MODERATE FREQUENCY - Enough to constitute consideration in CARE PLAN.
3. FREQUENT (OVER 1/WK) OR SPECIAL PROBLEM (e.g. ERATIC) - Requires constant/active consideration in CARE PLAN.

20. MEMORY DEFICIT: KNOWN HISTORY OF FORGETFUL BEHAVIOR - DANGEROUS TO SELF/OTHERS (E.G., SHUT OFF GAS, PUT OUT CIGARETTES, WATCH FOOD THAT IS COOKING-BURNS FOODS, ETC.) ____

21. IMPAIRED DECISION-MAKING: MAKES SERIOUSLY INAPPROPRIATE DECISIONS OR UNABLE TO MAKE ANY DECISION REGARDING ROUTINE MATTERS (E.G., FAILS TO PROTECT SELF). THIS IS NOT DUE TO LACK OF KNOWLEDGE ____

---

22. VERBAL DISRUPTION: BY YELLING, BAITING, THREATENING, ETC. ____

1= None during the past four weeks. (May have verbal outbursts which are not disruptive.)

2= Verbal disruption one to three times during the past four weeks.

3= Short-lived disruption at least once per week during the past four weeks *or predictable* disruption regardless of frequency (for example, during specific care routines, such as bathing).

4= Unpredictable, recurring verbal disruption *at least once per week*, but not daily.

5= Daily episodes of unpredictable verbal disruption.

23. PHYSICAL AGGRESSION: ASSERTIVE OR COMBATIVE TO SELF OR OTHERS WITH INTENT FOR INJURY. (FOR EXAMPLE, HITS SELF, THROWS OBJECTS, PUNCHES, DANGEROUS MANEUVERS WITH WHEELCHAIR). ____

1= None during the past four weeks.

2= Unpredictable aggression during the past four weeks (whether mild or extreme), *but not at least once per week*.

3= Predictable aggression during specific care routines or as a reaction to normal stimuli (for example, bumped into), regardless or frequency. May strike or fight.

4= Unpredictable, recurring aggression at least once per week during the past four weeks, but not daily, for no apparent or foretold reason (that is, not just during specific care routines or as a reaction to normal stimuli).

5= Daily episodes of unpredictable physical aggression.

24. DISRUPTIVE, INFANTILE OR SOCIALLY INAPPROPRIATE BEHAVIOR: CHILDISH, REPETITIVE OR ANTISOCIAL PHYSICAL BEHAVIOR WHICH CREATES *DISRUPTION WITH OTHERS* (FOR EXAMPLE, CONSTANTLY UNDRESSING SELF, STEALING, SMEARING FECES, SEXUALLY DISPLAYING ONESELF TO OTHERS), EXCLUDE VERBAL ACTIONS. ____

1= No infantile or socially inappropriate behavior, whether or not disruptive, during the past four weeks.

2= Displays this behavior, but is not disruptive to others (for example, rocking in place).

3= Disruptive behavior during the past four weeks, but not at least once per week.

4= Disruptive behavior at least *once per week* but not daily during the past four weeks.

5= Daily episodes of disruptive behavior.

SECTION VI SPECIALIZED SERVICES

Physical, occupational and speech therapies:

Level

1= Service not provided.
2= Evaluation visit only, no active follow up.
3= Improve to become independent.
4= Improve, but will continue to require assistance.
5= Stabilize, maintain current status to prevent further deterioration.
6= Slow the deterioration process.

Visits and Time Per Week: Enter the current average number of visits and total time per week provided by each therapy within the program boundaries defined for the client.

	Level	Average Number of Visits Per Week	Total Hours Per Week
25. Physical Therapy......	____	____	____
26. Occupational Therapy..	____	____	____
27. Speech Therapy........	____	____	____

28. PRIMARY PROBLEM: THE MEDICAL CONDITION REQUIRING THE LARGEST AMOUNT OF CAREGIVER TIME. NOT NECESSARILY THE ADMISSION DIAGNOSIS BY THE PHYSICIAN.

ICD-9 Code of medical problem .... _ _ _ . _ _ Primary
_ _ _ . _ _ Secondary

If codes cannot be located, print medical name here:

____

____
Signature of Assessor

Evaluating and improving the measurement of hospital case mix

by Stephen F. Jencks, Allen Dobson, Patricia Willis, and Patrice Hirsch Feinstein

The foundation of case-based prospective payment is the case classification system. The purpose of classification systems is to group together patients with similar treatment requirements. The systems described in this issue take a variety of theoretical and practical approaches to classification. The critical issue in comparing these systems is whether the variation in treatment requirements which is not explained by the classification system is associated with particular groups of patients, particular hospitals, or particular groups of hospitals in such a way as to result in unfair reimbursement. We suggest criteria for comparing classification systems and a research agenda for clarifying the fairness of different approaches.

This issue of *Health Care Financing Review* is devoted entirely to the accuracy of hospital case-mix measurement systems for reimbursing hospitals. We have brought together eight articles by active workers in this field, representing the most promising efforts to improve case-mix measurement. Although severity of illness is an organizing theme for these articles, their scope is much broader. The purpose of this paper is to give the reader four perspectives for reading these articles:

- An understanding of what case-mix measurement is and of the major approaches which are now being explored.
- An understanding of the importance of case-mix measurement to the Health Care Financing Administration (HCFA).
- An analytic framework which can be used to describe and compare different approaches to case-mix measurement.
- An outline of the research directions which appear likely, at this time, to be most useful to HCFA over the next five to ten years.

The nature of case-mix measurement

Case-mix measurement, as we discuss it in this issue of the *Review*, is the characterization of an inpatient stay in a way which permits us to predict the resources which are needed for care during the stay. This issue focuses on case-mix measurement as a tool for determining appropriate payments to hospitals, rather than for such uses as determining appropriateness of admission, quality assurance, hospital management, or epidemiology (Hornbrook, 1982).

For the purpose of paying hospitals, the accuracy of a classification system is measured by its ability to classify a case with other cases which have the similar costs for necessary care. When a case-mix system is used for payment, three steps are necessary: the hospital case must be placed in a class by the classification system; the class must be given a weight which indicates resource requirements relative to other classes of cases; and the system must assign multipliers which convert these weights to appropriate dollar prices. This paper and this issue of the *Review* are primarily concerned with the classification system rather than the weights and multipliers. However, to assess a classification system's ability to predict costs, it is necessary to calculate weights and compare them to observed costs, so the calculation of weights receives some consideration.

In reading about classification systems, it is useful to keep in mind that the data routinely collected about hospital inpatient care is the Uniform Hospital Discharge Data Set (UHDDS), a set of data elements found on the cover sheet of almost all medical records of a hospital stay. The UHDDS comprises age, sex, discharge diagnoses, procedures performed, type of place to which discharged, and whether the discharge was alive, dead, or against medical advice. Under UHDDS rules, the diagnosis which is listed first is the "principal" diagnosis—that diagnosis which, after study, is determined to be principally responsible for causing the admission. These data elements are routinely collected by Medicare and many other payors for all hospital admissions and are therefore routinely available in automated form for case-mix classification. Whether a classification system uses UHDDS data is obviously a matter of considerable practical importance, since other data is not routinely available either to test a system or to set weights.

This issue reports six major current classification strategies:

Diagnosis-related groups

The diagnosis-related group (DRG) system (Smits, 1984) has been developed at Yale University under John Thompson and Robert Fetter. DRG's are also being refined at Health Systems International, Inc. under direction of Richard Averill. DRG's are now used by Medicare and some other payors as a basis for payment and are the only classification system in

use for payment. DRG's are therefore the starting point for discussions of classification. The system operates on UHDDS data. The DRG system classifies a case into one of 23 major diagnostic categories (MDC) on the basis of the principal diagnosis. Once assigned to an MDC, the case is then further assigned to one of 467 DRG's on the basis of presence or absence of certain procedures, age of the patient, specific principal diagnosis, presence or absence of a significant comorbidity or complication, and, in a few cases, whether the patient died or was transferred to another hospital. For reimbursement there is an additional "wastebasket" for cases with surgery which is inconsistent with the principal diagnosis. The DRG's were developed using clinical judgment in concert with statistical analysis of a large number of hospital discharges.

Disease staging

Staging (Conklin, 1984) was developed at Jefferson Medical College under Joseph Gonnella's direction and is being further refined at SysteMetrics, Inc. by Daniel Louis and others. Staging has several forms, but in this discussion we consider only the computerized version which uses UHDDS data. Staging assigns each diagnosis to one of more than 400 conditions and then to one of 4 stages (5 in the case of cancer) of progression of disease within the condition category, depending on the exact diagnosis recorded. The stages are analogous to stages for cancer and reflect stage of progression from minimal disease to death. Unrelated secondary diagnoses are also staged. Under certain circumstances the computer program will reorder diagnoses if the principal diagnosis is vague or if another diagnosis appears likely on clinical grounds to be the principal diagnosis. The staging criteria were defined by specialists from their clinical experience rather than by consulting actual data on length of stay or resource consumption. Since a given stage of one disease does not predict the same resource consumption as the same stage of another disease, stage must be considered in conjunction with the diagnosis staged, giving a potential total of more than 1,700 classification groups. Staging makes use of secondary diagnoses in several ways, but other elements such as age, procedures, and transfer are considered in only a very small number of conditions (e.g., Caesarean section as a procedure is used to determine the type of delivery). A method for combining independent staged disorders in a single patient, which would be needed for reimbursement, is not yet automated.

Patient management categories

Patient management categories (PMC) (Young, 1984) has been developed at Blue Cross of Western Pennsylvania under direction of Wanda Young. The current, computerized version of PMC classifies patients into disease groups according to key diagnosis codes and then into a specific PMC. The categories were developed by panels of physicians, based on their clinical experience rather than on analysis of data. Each category is intended to represent a distinct type of illness requiring a distinct type of management. PMC places special emphasis on using multiple diagnoses to define the specific management category to which a patient is assigned; procedures are sometimes used to define categories when the diagnostic system does not have sufficient specificity. Within a disease group, a patient is assigned to the PMC which is expected to be most resource-intensive, but a patient could be assigned to PMC's in two or more disease groups. A method for combining multiple grouping for reimbursement is under development.

Severity of Illness Index

The Severity of Illness Index (Horn, 1984) has been developed at Johns Hopkins University under direction of Susan Horn. The severity score is assigned on a four-point scale using an "implicit" synthesis of seven sub-scale ratings, each of which is derived from chart reading. Rating of the subscales is done subjectively by trained raters who have had standardized training and use a system of benchmarks for the rating scale. Scoring has not yet been computerized although computerization is planned. In some studies, including one reported in this issue, the severity rating is further broken down according to a rating of the significance of surgery performed. Severity has been developed through an extensive process of testing against actual patient data in a variety of settings but has not been tested on national samples because of the cost of scoring the necessary number of cases. Because severity scoring is both the most ambitious and the most methodologically controversial technique, it receives special attention in this paper.

Acute physiology and chronic health evaluation

The acute physiology and chronic health evaluation (APACHE II) (Wagner, 1984) was developed at George Washington University under direction of William Knaus and Douglas Wagner. APACHE II uses admission values of 12 physiologic variables (acute physiology score or APS) such as blood pressure in addition to information about chronic health

conditions to produce a continuous variable; it is the only system which assigns cases a score on a continuous scale rather than assigning a case to a category. APACHE II has been extensively tested on intensive care patients but not on other patients, and it has not been tested as a general predictor of costs. This system is of special interest as a possible severity of illness measure to be applied in conjunction with other classification systems. APACHE II requires physiologic information which is not available from UHDDS or most other computerized abstracts, but direct acquisition of most of the necessary information from computerized laboratories might be possible. The necessary data is usually in the patient's record.

Medical illness severity grouping system

The medical illness severity grouping system (MEDISGRPS) (Brewster, 1984) was developed at St. Vincent's Hospital in Worcester under Alan Brewster's direction in conjunction with InterQual, Inc. MEDISGRPS uses admission values of a set of physiologic variables and clinical and X-ray findings to give the patient an admission severity score on a five-point scale. A second set of measurements is recorded a fixed time after admission, as further information for patient classification. MEDISGRPS was developed as a quality assurance tool and has been implemented at a number of hospitals for this purpose, but it is at an early stage of development as a reimbursement system. MEDISGRPS requires physiologic information which is not available from UHDDS. Medical record personnel need special training to abstract the data, which is usually in the patient's medical record.

HCFA's interest in case-mix analysis

As we pointed out earlier, this issue of the *Review* addresses case classification as a tool for hospital payment. A hospital's case mix is often considered its product in an economic sense, but a case is obviously what a hospital treats, while the care provided is the product. Nevertheless, if the variables used to classify cases in the case-mix system also determine the necessary diagnostic and treatment activities, case mix is an excellent proxy for care provided. We will discuss this important condition later in this article.

In the hospital prospective payment system (PPS) which Medicare has just put in place, case mix, as measured by the DRG system, is used as the measure of the hospital's product for purposes of payment. Under PPS a price schedule is published before care is rendered and the hospital is (in principal) paid an amount which is determined by the DRG into which the case is classified on discharge. PPS replaces a system in which reimbursement was based on retrospectively-determined costs. A classification system is essential to operating a prospective payment system based on per-case payment, since the classification of the case determines the payment.

In thinking about the use of classification in PPS it may be useful to think of PPS as actually comprising two separate reforms—paying for the case rather than for the individual services (this process of paying for larger aggregations of services is often called bundling) and determining the payment from a schedule published before care is rendered (prospective payment). The PPS reform has three distinguishable goals:

- To make Medicare's payments for hospital care predictable and controllable through prospectively determining payments for a unit of service (the admission) whose volume and composition has historically been relatively stable and predictable.
- To permit fair allocation of finite resources. Fairness means that different hospitals are paid comparable amounts for the care of like cases.
- To give hospitals incentives to provide care as efficiently as possible by eliminating the per-service retrospective payments which encouraged long stays and profligate use of services.

In the short term, the accuracy of case classification is far more important to the fairness of PPS than to its incentives for efficiency. Even if the DRG system is quite inaccurate, paying by the case creates strong incentives to shorten inpatient stays, to provide some services for the inpatient stay prior to admission or after discharge, and to provide fewer services. Even if the system does not classify together cases which require similar resources, it still encourages the hospital to treat each case as efficiently as possible.

On the other hand, if DRG's are not accurate, then reimbursement is not likely to be fair, since payments will not be well related to the resources necessary to treat each kind of patient. These inaccuracies could create perverse incentives to transfer or avoid some kinds of patients while selectively recruiting others. Such incentives could both disrupt the health care system and create access barriers for some Medicare beneficiaries. Furthermore, hospitals which continued to treat all patients in the face of these irrational incentives could face severe financial problems, not because of their own management shortcomings but because PPS did not reimburse them accurately. Such adverse effects could make the health care system less rather than more efficient.

Some investigators argue that there is so much flexibility and "fat" in the health care system that even fairly serious inequities will simply be absorbed. To put this argument differently, standard treatment will simply align with the resources available under the DRG system as health care providers respond to the PPS reimbursement levels. If a payment system resulted in every hospital being paid the same inadequate amount for comparable cases, this might be true, but such an outcome would reflect only errors in calculating weights and multipliers. If the classification system is inaccurate, hospitals will be paid the same amount for cases which differ clinically and

appear to clinicians to have different treatment requirements, and clinicians will probably be highly resistant to treating such patients in an identical fashion.

Because classification systems rely on relatively limited data to describe patients and generally classify patients into a limited number of categories, they are inevitably imprecise at the case level. Thus, it is not possible even in principle, to determine whether classification systems or case weights are accurate by looking at individual cases. The appropriate measure of accuracy is whether the patients in a DRG in one hospital have the same average treatment requirements as do patients in that DRG in other hospitals across the Nation. Since there is variation among cases, even the average treatment requirement for patients in a DRG in a hospital can only be expected to approximate national average treatment requirements for the DRG when the number of cases is large (the law of large numbers).

The concept of treatment requirements is important here. Treatment, obviously, is a shorthand term which includes diagnostic activity. More important, however, the concept of treatment requirements does not imply a treatment protocol; it simply implies the resources necessary to provide treatment. In the next section, when we consider economic neutrality, we touch on the problem of situations where there may be different costs for the same case.

The critical question in determining fairness of a classification system is whether hospitals can receive, select, or recruit patients who have either higher or lower treatment requirements than the national average for that DRG. This question can be put in a different way: Variation in treatment requirements does occur for patients within a DRG. Does that variation correlate with factors which can determine the hospital which a patient enters, or is variation "random" with respect to those factors? If the former is true, the system is either actually or potentially unfair. If the latter is true, the system is fair. Teaching hospitals, public hospitals, and specialty hospitals can easily demonstrate that their patients have distinctive characteristics (e.g., being referred, being poor, having special kinds of illness). The issue is whether these distinctive patient characteristics are correlated with the variation in treatment requirements within a DRG. If that correlation exists, then hospitals with disproportionate numbers of these patients will not be paid according to actual treatment requirements.

HCFA's most urgent research need in case-mix classification is to determine whether the DRG system is fair to classes of beneficiaries, to individual hospitals, and to classes of hospitals. Resolving this question is important because any problems which exist should be promptly identified and corrected. But demonstrating the fairness of the system convincingly is also important because erroneous beliefs that the system is unfair may create access problems for some Medicare beneficiaries. For example, if hospital managers believe that the poor, the frail elderly, or the disabled have greater treatment needs than other patients in the same DRG, then these groups of patients may have difficulty getting care. Such prejudices are especially likely to become a basis for action if a hospital finds its reimbursement under PPS falling from historical levels. It is therefore extremely important to the success of PPS both that the case classification system be fair and that it be perceived as fair for all classes of patients as well as for all kinds of hospitals.

When planning research in this area, it is useful to keep in mind that the accuracy of a classification system can be substantially compromised by a weighting procedure which does not accurately reflect the differences between cases or by multipliers which do not result in appropriate payments. Accordingly, it is important in assessing a system to assure that when tests which require weights, that the weights have been calculated accurately.

HCFA also has a broader interest in accurate case mix. Developing an accurate per capita price for a health maintenance organization or a competitive medical plan requires a sophisticated and precise measure to predict the needs of Medicare beneficiaries. Solving the problems discussed above supports development of capitated systems because a competitive capitation system is likely to need methods for setting rates which are more precise and sensitive than the methods of the current Medicare average annual per capita charge (AAPCC). The research agenda described later in this article should strengthen Medicare's capabilities in this area.

A framework for comparing case-mix systems

Comparing classification systems presents several difficulties, not least of which is the paucity of published information. Part of this scarcity is attributable to systems being very new (this issue contains the first journal publication on MEDISGRPS, and the computer program for PMC has just been completed). However, even for systems on which there are published articles in refereed journals, there are two significant problems. First, with the exception of DRG's, almost all published material is written by the developers of the system: a benchmark of scholarly evaluation is replication of results by investigators

other than the developers. Second, again with the exception of DRG's, there is no information on system performance using national data. Third, with the exception of Horn's work comparing DRG's and severity score, there are no published comparisons between systems.

Despite these extremely significant problems, we believe that it is useful to compare systems along three major axes: conceptual foundations, administrative implications, and empirical performance.

Conceptual foundations

Three conceptually important features of a classification system are the assumptions it makes about determinants of resource requirements, the economic neutrality of the system, and its clinical reasonableness. In addition, systems differ both conceptually and empirically in the degree to which they classify patients on the basis of care received as opposed to care actually required.

Determinants of resource requirements

Classification systems implicitly conceptualize determinants of resources required to diagnose and manage a patient. Among these determinants are the degree of diagnostic effort necessary, the nature and severity of the patient's condition on admission, the response of the patient to treatment, and the goals of treatment. Case-mix measurement systems differ in how many of these variables they recognize. For example, staging recognizes diagnoses but not variations in diagnostic needs, responsiveness to treatment, or treatment goals. DRG's include procedures, which can be a proxy for treatment goals, but DRG's do not consider diagnostic efforts or response to treatment. PMC addresses diagnostic efforts and treatment goals only indirectly, and does not consider treatment response. Severity of illness measures more variables (e.g., response to treatment) but does so less explicitly, while degree of diagnostic effort and goals of treatment do not seem to be considered. APACHE II and MEDISGRPS exclude diagnostic efforts or treatment goals, but are much more precise about severity of condition, and MEDISGRPS is more sensitive to response to treatment.

Economic neutrality

A system which neither rewards nor penalizes a hospital for performing an activity is economically neutral to that activity. For example, DRG's use major procedures to classify patients. If reimbursements are properly calculated for the DRG's with and without surgery, the difference in reimbursement is the cost of surgery, all other things being equal. Thus, the hospital is neither rewarded nor penalized for the performance of surgery and the provider is free to make this decision on clinical grounds. While large and small hospitals in Maryland have very similar case mix as described by staging, large hospitals have more complex case mix as described by DRG's. This presumably means that larger hospitals do more procedures for patients at a given stage of illness, since DRG's consider procedures while staging does not. One might argue that this represents overutilization and should be discouraged or one might argue that it represents appropriate concentration of specialized procedures in specialty centers and should be treated with neutrality. If we adopted the former view, we would (if staging and DRG's are otherwise equal) adopt staging for case-mix classification since staging does not recognize procedures in classifying patients and thus creates an incentive for hospitals not to incur the costs of surgery. If we adopted the latter view, we would use DRG's for case-mix classification since DRG's are neutral to performance of procedures and therefore do not penalize a hospital for becoming a surgical referral center. The same argument can be applied, for example, to whether hospitals treat psychiatric patients in specialized units. If we regarded such treatment as potentially useful, we would classify it as a procedure and recognize it in the classification system; if we regarded it as wasteful, we would not recognize it in the classification system and there would be strong economic incentives not to use such treatment. These two examples suggest that the problem of neutrality is an intensely important policy issue. It is clear that neutrality with regard to equivalent treatments of different cost is a far-reaching issue since it raises the problem of the extent to which Medicare will pay for patient and physician preferences.

Clinical reasonableness

Clinical reasonableness means that a classification system classifies together cases which are clinically similar in their management. This is important for two reasons:

- A clinically reasonable system is likely to retain its power as relative costs of treatments change and even as clinical practices and technology evolve.
- A clinically reasonable system is more likely to be acceptable to administrators and physicians.

Clearly, the chart-reading methods of the severity score are the most closely connected to clinical data and therefore most clinically reasonable from that

perspective. The dependence on vital signs and critical findings in APACHE II and MEDISGRPS is highly reasonable for conditions where emergency admissions and critical illness are likely, but their applicability to elective surgery and noncritical illness is unclear. The detailed use of patterns of diagnoses (and sometimes procedures) in PMC, and to a lesser extent in staging, make them more clinically credible than coarser systems such as DRG's. However, many clinicians are suspicious of systems relying exclusively on diagnosis to determine what care is necessary.

Ability to distinguish necessary care from care rendered

A classification system which depends heavily on care actually rendered tends to return the payment system to cost-based reimbursement. Unfortunately, even diagnoses tend to depend on services rendered, since a large part of health care activity is diagnostic. The method most independent of care actually rendered is MEDISGRPS, which uses physiologic measures and presenting complaint and does not use specific diagnoses. APACHE II, which uses only chronic diagnoses, is also relatively independent of diagnostic effort. PMC's and staging depend on detail in diagnoses, and this may be correlated in some settings with either maintaining a teaching program or with extensive workups. DRG's depend heavily on whether an operating room procedure was performed although not on other elements of care, while PMC's and staging use procedures in a very limited way.

Administrative considerations

From an administrative perspective, systems differ in two important ways—data costs and risk of encouraging gaming or perverse incentives.

Data costs

All classification systems require data collection. However, DRG's, PMC's, and staging run on computers using UHDDS data which is already collected by Medicare. This is a major practical advantage. APACHE II and MEDISGRPS run on a defined clinical data set which could be collected as part of discharge abstracting by medical records technicians with minimal training. Severity, which is the most impressionistic or implicit method, requires chart reading by individuals with training well beyond that of most medical records technicians. All of the methods except severity can be performed by computer once the data is abstracted.

Incentives and gaming

A classification system, when implemented with accompanying weights, provides a set of incentives for hospitals. Some of these incentives are market incentives—it may be profitable to seek certain classes of patients while avoiding others. Other incentives are invitations to "gaming"—those maneuvers by which a hospital can enhance its revenue without improving its services and which run contrary to the intent of the system. Examples include some rearranging of the order of diagnoses in systems such as DRG's which are responsive to this order, dividing a single admission into two or more admissions, and reporting marginal complications and comorbidities to change the DRG classification (Gertman, 1984). If a relatively implicit system such as severity was used at hospitals by hospital personnel, the risk of gaming would probably be high enough to require an active audit system. Gaming shades into fraud, with such overt activities as reordering diagnoses in violation of accepted standards, deliberately miscoding diagnoses, or reporting procedures which were not performed. The importance of gaming in the real world of hospital management is hotly debated, but there is consensus that a classification system should place minimum emphasis on ambiguous information which might be gamed and that the incentives of the system must be carefully examined.

Empirical issues

Empirically, there are two critical tests of a system—reliability and ability to account for variation.

Reliability

A case-mix system should reliably classify the same case in the same way when that case is abstracted by different abstractors. Although all systems described in this issue except Severity of Illness Index are computerized and therefore appear reliable, significant variations actually exist.

Assignment of diagnosis by a physician and coding of diagnosis by a records technician involve judgment, particularly in determining the principal diagnosis. When the Institute of Medicine (1977) studied coding under the *International Classification of Diseases, adapted for use in the United States, Eighth Revision*, there were errors in 30 percent of cases, and in 10 percent of cases experts could not agree on the correct coding (Demlo and Campbell, 1981; Grimaldi *et al.*, 1983). The current diagnostic system (*International Classification of Diseases, Ninth Revision, Clinical Modification*) is more specific; coding conventions are more widely shared; and the incentives of PPS will almost certainly improve data quality. Indeed, the incentives of PPS might lead to consistent resolutions of ambiguous situations in a way which, by emphasizing reimbursement, will conceal the ambiguity. The Inspector General of the Department of Health and Human Services has, however, compiled a substantial list of situations in which judgment calls would result in assignment to different DRG's and consequently in different reimbursement. And there are common situations in which coding according to established conventions runs counter to clinical intuition and provides less information than "clinically appropriate coding." DRG, staging, and Severity of Illness Index

all depend on decision as to the principal diagnosis. Despite the importance of this issue, there is no data comparing the sensitivities of these different systems to empirically-observed coding error rates.

The Severity of Illness Index, an apparently more subjective method, has high reported interrater agreement for most raters, but the reliability figures are reported in a way which makes precise interpretation difficult. The way in which the subscales are scored is subjective, despite the guidelines provided, and there is no explicit way to combine the individual scales into the Severity of Illness Index. It is important to realize that, because Horn suggests using the Index as a refinement within DRG, errors in the Index add to the errors in diagnosis coding for DRG rather than replacing them; thus it is not appropriate simply to compare error rates for the two, even if data for such comparisons were available.

The Severity of Illness Index presents another potential problem which lies between reliability and validity: It is not clear whether raters may respond in scoring to the diagnostic efforts made and the care rendered rather than to the actual condition of the patient. Considerable clinical skill is required to discriminate between diagnostic efforts made and the clinical evidence which may have occasioned them, particularly when working from a medical record rather than from the clinical setting. Furthermore, extended and intensive care usually produces a more documented chart, and it is difficult to determine the degree to which such documentation influences the Severity of Illness Index, independent of the necessity for the care.

When examining reliability figures, it is extremely important to know whether errors are random (and can therefore be expected to cancel out for large numbers of cases) or whether they are or can be made systematic (so that they would bias overall payments even for a large hospital). If the latter is the case, rather modest error rates can jeopardize the integrity of an entire system and must be taken very seriously. For this reason, reliability should be reported in terms of its impact on overall payments to a hospital under a reimbursement model. Such data is not available for any classification system.

Explained variance

Investigators often measure the power of a classification system by the amount of variance in either resources used or length of stay which the system explains. Statistically, this is equivalent to the requirement that a good classification system should have substantial differences between groups and considerable coherence within groups. However, a classification system which explained 100 percent of the variance would not be good—it would implicitly assert that all care was necessary and would effectively return a reimbursement system to cost-based reimbursement. Unless it is desirable to pay for variations in physician and hospital efficiency, for example, it is not desirable to account for them in a classification system.

The data which is not considered by a system sets an upper limit on how much variance a system can reasonably account for. For example, variation in clinical practice between physicians is probably quite important and Horn has pointed out a useful direction by studying the contribution which considering inter-physician variation can make to assessing a case-mix system. But one might also wish to know the importance of such factors as whether the diagnosis was known before admission, the purpose of treatment, and disposition problems; one would need to be skeptical of a system which explained very large portions of the variance without considering such factors.

We have been unable to locate any published report of the power of any of the classification systems described in this report when applied to any national data base. The closest approximation is the data of Pettengill and Vertrees (1982) on the power of DRG's to account for variation in average hospital case cost using Medicare data and Horn's reports of Severity of Illness Index's explanatory power in a group of about 30 hospitals.

The problem of explained variance relates to the question of how many categories a system should have. Systems with a larger number of categories tend to explain more of the variance in resource use. A number of critics have suggested that the number of categories should be limited because the number of cases in individual patient categories in an individual hospital will otherwise be too small to support systems of payment based on averaging. Number of cases in a category is not a problem in itself, since the total number of cases in the hospital rather than the number in each category determines the degree to which the law of large numbers protects the hospital. It is true, however, that as the number of categories proliferates, larger data sets are required for calculating weights and that the overall system becomes somewhat less useful to the hospital as an internal management tool.

Finally, explanatory power may not be the most important determinant of the fairness of a reimbursement system. As noted in the last section, the critical question is whether the system is fair to groups of patients and hospitals. Although intuition suggests that the two questions are equivalent, they may not be in practice, and this question also invites empirical studies which have not been done.

A research strategy

The research problem described earlier is how to identify and correct variation in requirements which occurs between patient groups, hospitals, or types of hospitals. To this end we now describe a possible staged research agenda (Gertman, 1984).

For the short range (1985-86), this agenda might start with defining and making plans to acquire a data base for adequate comparisons of competing classification strategies. This agenda might also include activities which could yield immediate results such as new ways to compute weights for DRG's, ways to sharpen the DRG classification system and to merge DRG's with other UHDDS-based systems, and ways to use information about previous patient treatment.

For the intermediate range (1987-88), the agenda might include studying whether there are real unmeasured variations in patient treatment requirements between hospitals and studying ways to update both the DRG classification system and pricing to reflect changes in practice and technology.

For the longer range (perhaps 1990), the agenda might include developing and testing case-mix systems which represent a full generation of advance over the present DRG's and which consider variables such as the degree of previous diagnostic knowledge about the patient, the purpose of the admission, psychosocial characteristics of the patient, and whatever issues concerning severity of illness have been proven important in the intermediate range research.

Short-range research

It is clear that adequate comparisons for competing classification systems will require large and expensive data bases. Planning the form of such data bases and starting to acquire them has high priority in research to improve classification systems; although many results from such a data base may not be available in the short term, comparisons of staging, PMC, and DRG can be accomplished quite rapidly and it is possible that studies of other methods can also be completed quickly. These results will be of great importance in planning longer-range research.

In the short range we also need to study whether we can improve DRG system performance by using cleaner data or better procedures to weight the DRG's, by improving the DRG classification system, by incorporating successful aspects of other UHDDS-based systems such as staging and PMC's, or by using treatment history as data.

Weighting procedures

PPS might be significantly improved by using better data and procedures for developing weights, and improved performance might be apparent if the improved DRG's were tested on better data.

The discharge data used for creating weights should be as accurate as possible. The incentives of PPS should result in a steady improvement in data reported to Medicare, as should the application of automated editing procedures. In addition, physician bills could be used to validate hospital procedure codes and possibly other data. It would also be desirable to eliminate data pertaining to care which has been disallowed on review, which might imply a preference for data from regions where review has been especially vigorous or effective.

We can also test modifications to the weighting system which would counteract known or suspected biases. For example, we know that the use of average per diems understates the variation in nursing costs. Further study of nursing intensity (Thompson, 1984) would also shed light on this issue.

DRG classification system

We do not discuss here the efforts which HCFA is already making under Congressional mandate to include psychiatric and rehabilitation units of general hospitals, psychiatric and rehabilitation hospitals, childrens' hospitals, and long-term care facilities within PPS. There are three other directions for work on the DRG algorithm:

Refining the present algorithm: The existing DRG algorithm has a number of important limitations which could be explored and perhaps improved by very straightforward research in the following areas:

- The lists of comorbidities and complications are not specific to the MDC's in which they are applied and have not been validated. These lists should be refined and the methods of dealing with comorbidities and complications suggested by Young should also be explored.
- Certain cases which are highly similar in treatment strategy and resource use are assigned inappropriately to different DRG's because of an assumption that a patient should not reach the same DRG from two MDC's. Thus, for example, a patient admitted for end-stage diabetic renal disease goes into a different DRG from a patient with end-stage hypertensive renal disease.
- The possibility of classifying patients according to operative procedure rather than diagnosis needs to be explored in cases where a major operative procedure relates to a secondary diagnosis rather than a primary diagnosis.
- Methods are needed to classify multiple identical procedures such as bilateral hip replacements or bilateral cataract procedures.

Synthesizing DRG's with other UHDDS-based systems: Staging and patient management categories are computerized systems which operate on the current Medicare data set. Although merging the methods presents substantial technical problems, SysteMetrics has done work on a synthesis of staging and DRG's for a few DRG's which suggests that this strategy may be effective (SysteMetrics, 1984). A

broader effort involving both staging and patient management categories is conceptually straightforward and could proceed as soon as 1983 data is available. Other systems, which cannot operate from UHDDS data, cannot be merged with the DRG system at this time.

Using previous treatment as a patient variable: An important piece of information about patients—previous inpatient and perhaps outpatient treatment—is available from Medicare files but has not been used for case-mix analysis. Previous treatment may be a better indicator of comorbidity and the severity of disease than those data elements used by DRG's. The Medicare file of previous admissions may also be a useful tool for approaching the problem of "split admissions": cases in which medical judgment would permit managing a problem on either a single admission or two admissions.

Intermediate range research

In three to four years we should be able to complete studies to determine whether there are significant variations in treatment requirements among hospitals which are unmeasured by DRG's. There are two general approaches to this problem:

Overall characterization of hospitals using multiple methods

This is the research which should be done on the data bases planned under short-term research, perhaps including special on-site data collection to measure necessity for treatments rendered. This approach would probably characterize the case mix of hospitals using APACHE II, MEDISGRPS, Severity of Illness Index, and on-site data. These methods would be compared to the refined DRG's developed in the short range program. The different methods may have special power if they are used to cross-validate one another. The goal of this combined analysis would be to compare for different hospitals the degree to which differences in cost reflect differences in services rendered for comparable cases as opposed to differences in case mix. In particular, this strategy would allow us to determine whether public, teaching, and specialty hospitals truly have different case mixes from those measured by the DRG system.

Tracer conditions

A second approach to estimating the degree to which care rendered exceeds necessary care in different hospitals is to fully analyze certain tracer conditions to determine whether hospitals have different costs for conditions which are identical when fully corrected for intensity of illness and other variables. List's (1983) study of management of myocardial infarction in Maryland and Oregon provides an example of how such a study might be carried out. By examining common conditions for which very similar cases can be selected in different hospitals, such studies can shed great light on the relative efficiencies of different kinds of hospitals. The same methods can clarify the relative treatment requirements of different subgroups of patients in the same DRG.

Either of these strategies would permit us to accurately distinguish between hospitals which are winners and losers under PPS because of unmeasured case-mix variation and hospitals which are winners and losers because of efficiency or inefficiency. The former strategy would be somewhat more persuasive because it would consider all cases in a hospital, but it would also be more complex and difficult.

Other studies

Studies are needed of ways to update classification schemes to incorporate advances in practice and technology. This task would include studies of the differential impact of systems of classification and weighting on adoption of new practices and technology. Studies might also explore ways to appropriately recognize new practices and technology in the classification scheme as they are introduced. This problem is not simply a matter of maintaining the classification and weighting system—it also includes maintaining the diagnostic and procedure nomenclature. Over the next five years, a new diagnostic system, *International Classification of Diseases, Tenth Revision*, will be designed. Traditionally, diagnostic coding has been little influenced by considerations of reimbursement. A major research task will be determining the degree to which diagnostic nomenclature should be modified and the degree to which those modifications are possible within the international agreements which govern the system used in the United States. A similar major task will involve establishing a procedure classification system that is better suited to reimbursement.

Long-term research

Long-term strategies rest on more sophisticated concepts of case mix. These strategies assume that by the end of the intermediate phase we will have a classification system which better reflects patient condition. However, factors other than patient condition influence treatment needs and should be measured in a more sophisticated system.

The purpose of treatment

Physicians may have different goals in treating patients with similar conditions. Patients admitted for terminal care will receive very different care from a patient whose physician is determined to save him. Garber *et al.* (1984) found that a significant part of the greater costs of treatment at teaching hospitals may be related to the fact that in a nonteaching service more patients with a high risk of dying were admitted for essentially supportive care. It is interesting that, although the teaching patients appeared to have a lower in-hospital mortality, their mortality at 9

months followup was the same as the nonteaching patients in the same hospital, suggesting that the teaching service may simply spend more effort prolonging the inevitable. Treatment goals may vary widely for other reasons. For example, two patients in identical condition may be admitted to a rehabilitation hospital with quite different rehabilitation goals for the individual admission. A psychiatric hospital may set very different goals for two very similar schizophrenic patients depending on data not easily found in the record. Or a surgeon may select paliative treatment for one cancer patient and aggressive curative surgery for another, based on patient preference.

Knowledge about the patient at admission

When the diagnosis is known before admission, one can expect less need for diagnostic activity and diagnostic cost and, since the admission is more likely to be for treatment, we can expect more treatment activity and treatment cost. Several competing systems, notably PMC's, seek to address this problem, but the degree of success is uncertain.

Patterns of clinical practice

Equally-trained physicians treat similar patients in different ways. Some operate on asymptomatic gallstones, others do not; some hospitalize for unexplained chest pain, others do not. Wennberg (1984) has documented the wide variations in admitting and surgical patterns. Thus, there will be considerable variation in the diagnostic and treatment activities defined as necessary by different experts.

Referral practices

In communities there are often patterns of referral which result in differential assignment of the most difficult or treatment-resistant cases to certain hospitals. For example, in communities where general hospitals will not accept committed psychiatric patients, the most difficult patients are routinely triaged to hospitals which will accept commitments. Similar effects are said to occur with patients from nursing homes in some cities. Unless these referral criteria are included in the data set for testing the classification system, they may be very difficult to pick up indirectly. With other kinds of referrals, decisionmaking may be based on factors which are intuitive and difficult to quantify. Field studies could clarify the importance of these practices.

Psychosocial characteristics of patients

Large urban hospitals have argued that psychosocial factors (such as whether patients have a fixed address, have sufficient money to alter living arrangements, have someone at home to care for them) strongly influence length of stay and care costs for medical-surgical patients. These variables are especially important because, as suggested earlier, hospitals can easily create admission barriers for patients they do not want if they believe that the variables are important but not recognized in the classification system.

This research requires developing measures for new variables as well as collecting data to measure their impact and their importance for prospective payment; both the methodology and the analysis will be extremely challenging.

Conclusion

HCFA's interest in case-mix analysis is necessarily intense, and its stake in the accuracy of the system which it uses is high. With PPS in place, a systematic program of research to test the adequacy of the DRG system and simultaneously to improve the system is essential to making PPS fully effective. We believe that the papers in this issue of the *Review* provide the basis for long-range thinking and hope they will help to stimulate the needed research.

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A multidimensional approach to case mix for home health services

by Kenneth G. Manton and Tony Hausner

Developing a case-mix methodology for home health services is more difficult than developing one for hospitalization and acute health services, because the determinants of need for home health care are more complex and because of the difficulty in defining episodes of care. To evaluate home health service case mix, a multivariate grouping methodology was applied to records from the 1982 National Long-Term Care Survey linked to Medicare records on home health reimbursements. Using this method, six distinct health and functional status dimensions were identified. These dimensions, combined with factors describing informal care resources and local market conditions, were used to explain significant proportions of the variance (r^2 = .45) of individual differences in Medicare home health reimbursements and numbers of visits. Though the data were not collected for that purpose, the high level of prediction strongly suggests the feasibility of developing case-mix strategies for home health services.

Introduction

The growth in the demand for various types of long-term care (LTC) community and institutionally based services resulting from population aging in the United States has been well documented (e.g., Manton and Liu, 1984). In large part, this demand is driven by the rapid growth of the oldest of the elderly population (those 85 years of age or over) the group that has the highest per capita levels of need for a variety of LTC services (Soldo and Manton, 1985). Furthermore, the medical and functional characteristics of different subpopulations in the community based (Soldo and Manton, 1985) and institutional (Manton, Liu, and Cornelius, 1985) LTC populations have been described using data from the 1982 National Long-Term Care Survey (NLTCS) and the 1977 National Nursing Home Survey (NNHS) (Manton and Yashin, 1986). That information can be used to project the probable future aggregate demand for specific types of LTC services.

Given the well-documented growth in the need for LTC services of different types, the question arises of how to provide those services in an efficient and cost-effective manner. One proposal is to provide such services through a prospective payment system that will foster competitiveness among providers in the private market and still maintain cost discipline. Prospective payment systems have proven effective in controlling acute hospital care costs for Medicare. Under these systems, a fixed amount specific to each of 467 diagnosis-related groups (DRG's) is paid to providers as reimbursement for all services required for the treatment of that patient. An alternative type of prospective payment is capitation, where a contract is let to provide all appropriate medical services for a fixed period of time, rather than for a specific disease episode. This is the basis of the Medicare risk option for health maintenance organizations that uses the adjusted average per capita costs formula (Kunkel and Powell, 1981) to set capitation rates.

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Though prospective payment has proven effective in controlling acute care hospital costs, there are additional technical difficulties that have to be overcome before a prospective payment system can be constructed for LTC services. These technical difficulties arise from the need to develop a case-mix measure to insure that incentives exist to provide services to the more seriously ill and debilitated patients. Without a case-mix measure that matches reimbursement to the level of services needed by a particular patient, perverse incentives can emerge for the provider to selectively treat healthier patients to minimize costs while maximizing revenue.

The following are reasons why the development of a case-mix measure is more difficult for community-based LTC services:

- The determinants of service need are more complex, involving several dimensions (e.g., cognitive and physical) of functional disability as well as the medical condition of the patient.
- A practical system for reimbursing LTC services must preserve incentives to continue informal care assistance; thus living arrangements, family structure, and economic resources are relevant concerns in an LTC case-mix measure.
- It is difficult to define a community-based LTC service episode. Thus, a case-mix measure for community-based LTC services is intrinsically more complex than that for acute care because it must describe a multidimensional system of health, functional, and social needs evolving over a potentially long time span.

In this article, we explore a strategy for developing a case-mix measure for a particular type of community-based LTC service—the home health services reimbursable under Medicare. A study of Medicare home health reimbursement is particularly important becasue of the following:

- The recent rapid growth of Medicare expenditures for the home health benefit.
- The wide variation in home health service prices in different areas of the country (because of large differences in the availability of services and the newness of such services in the market place).

- The relative lack of prior empirical research (and literature) on this topic.
- The perceived merits of this type of service (in contrast to institutionalization) for preserving the autonomy and quality of life of elderly persons.

This proposed case-mix strategy is based on a classification procedure that is not only multivariate and multidimensional but that also represents individual heterogeneity by using continuous scores or weights. We applied this strategy to data on medical problems and functional limitations for persons receiving Medicare home health benefits who were interviewed for the 1982 NLTCS (Macken, 1984). With case-mix measures developed from the 1982 survey data, we examined variation in home health reimbursements and number of visits as reported in the Medicare Part A files. We examined the case-mix system in terms of the clinical distinctiveness of the case-mix categories, differentials in mean levels of service use among case-mix groups, and the ability to predict individual levels of home health benefit use by using case-mix measures.

Data

Two basic types of data were required for our evaluation: data to form the case-mix measure; and data on home health care costs or service use.

Data to construct the case-mix measures were taken from the 1982 NLTCS (Macken, 1984), a household survey of noninstitutionalized persons 65 years of age or over who reported (or expected) an activity of daily living (ADL) or an instrumental activity of daily living (IADL) limitation of 3-months duration or longer. To identify cases for the household survey, a sample of roughly 36,000 persons was drawn from the health insurance master file. From these cases, 6,393 persons were identified in the telephone screen as chronically disabled; and 6,088 were eventually contacted for the household survey. Of the 6,088, 5,583 persons fully completed the household interview, which covered a wide range of topics such as health status, functional limitations, informal care, and service use.

Data on home health reimbursement for all 36,000 persons drawn from the health insurance master file were available from Part A Medicare records, which contained information on reimbursements for hospital stays, home health use, and skilled nursing facility (SNF) use as well as data on home health use reimbursed under Part B Medicare. This yielded a total of 113,500 Part A bills of all types and 3,500 Part B home health bills for the period 1978 through the first quarter of 1985. Of the 117,000 total bills, about 24 percent were for home health reimbursement. The focus of these analyses is on home health service use in the interval 1982 to 1985.

By linking the Part A Medicare bills for the period 1978 to 1985 for individuals, it was possible to define different episodes of care with periods of service linked according to certain rules and fixed intervals of different lengths in which all service for a person is counted. After the episode or fixed-interval service use measures were created, they were combined with the data on health and functional status from the 1982 survey. These combined files were used for the two stages of our analysis—i.e., for construction of the case-mix index from the survey data and the analysis of the association of the case-mix index with different measures of service use.

Different service-use measures are required to model and analyze different types of reimbursement systems. The episode definition is required for reimbursement of all services associated with a specific health event or condition, and the fixed-interval model for assessing costs is necessary to evaluate capitation reimbursement. Because we had Medicare Part A service data back to 1978, we could also examine the effects of prior hospitalization and SNF use on the different episode and capitation home health service measures.

In defining the measure of service for either episodes or the capitation periods, several factors were considered. One was the amount of time over which home health service use is cumulated. Because the survey was not administered at the beginning of the service episode (or the capitation period), one has to restrict the period of time around the survey date over which service use is linked so that the service use is not too temporally distant from the health and functional conditions recorded in the survey. Clearly, the longer the time interval, the less likely are the health and functional characteristics reported in the survey to represent the characteristics of persons when they receive services. Given that the person was required (or expected) to have a chronic disability of at least 3-months duration, time intervals of 6 and 12 months were investigated.

The second factor involved the rules for linking services. The capitation model required taking all services delivered in a fixed period of time. For episodes, which can be of varying lengths, rules had to be made to link different types of services—e.g., an episode might be defined by a hopsitalization beginning in a period of up to 90 days before or after the survey date that leads to home health use and might include all services until no service was delivered for at least 60 days. In Table 1, we present the number of disabled elderly submitting bills for home health visits.

We conducted analyses for the seven different types of episodes and intervals. For three types, analyses were conducted of both Part A and Part B home health bills; and for four types, only Part A bills were analyzed. Because Part B use was relatively rare, the analyses of combined Part A and B use were similar to those for Part A use only. Consequently, the analyses presented describe only the more inclusive definition for two situations—for 1,316 persons with episodes beginning within 6 months of the survey date and for 1,286 persons with home health Part A or Part B bills beginning in 1982.

Of the 1,286 persons in the capitation model, 691 were determined to be chronically disabled according to the criteria used during the telephone screen, and

they were included in the household interview. Also, 644 of the 1,286 completed most of the interview and were used in the multivariate analyses. The remaining 642 persons were included in the analysis, but there was limited information for them. In the episode analysis of 1,316 cases, 672 people completed the interview; and there was full health and functional status information for them. As in the capitation analyses, only limited demographic and service-use information was available for the remaining 644 cases. In addition to the data on hospitalization and SNF use in Part A records, we know that 604 of the 1,316 passed the telephone screen, and they did not report chronic disabilities.

Construction of case-mix measures

Methods

The dimensions to be used in our case methodology were identified using the Grade-of-Membership (GOM) procedure (Woodbury and Manton, 1982), a multivariate classification methodology. GOM has two components. The first component is a description of the relation of each case-mix dimension to each of the variables selected for analysis. By the GOM procedure, a prespecified number (say K) of dimensions can be identified by using the available information. The second component is a grade or weight for each person representing how much each person is described by the characteristics associated with a given case-mix dimension. A person can be represented by more than one case-mix dimension and have different degrees or grade of membership for each.

The GOM model can be compared with another frequently used type of multivariate analysis, i.e., factor (or principal-component) analysis. As in GOM, factor analysis is used to extract the smallest number of basic factors or of latent variables that explain the nonrandom variation of the original measures. To do this, two types of coefficients are produced. First, factor loadings are produced that are the correlations between the original measurements and the analytically determined factors. The pattern of correlations is used to describe the latent variables in terms of their relation to the original measurements. Factor loadings are similar to the first type of GOM coefficient except that the GOM model is applied to discrete response data so that the GOM coefficients are probabilities rather than correlations. The second type of coefficient produced in a factor analysis are factor scores. These are calculated after the factor loadings, and they represent how much a person has a given factor. The GOM scores are logically similar to factor scores except that, because we are describing subpopulations using discrete response data, the GOM scores are restricted to the range 0 to 1.0 and they must add to 1.0 for each person over the full set of

Table 1

Number of disabled elderly persons submitting bills for home health visits, by time interval and rule for bill inclusion

Rules for bill inclusion	Time interval of visit: 6 months before or after survey date 2/82-3/83	3 months before or after survey date 5/82-11/83	Within 12 months of survey date 8/82-8/83	Within 12 months of 1982
Capitation interval				
Any part of bill within interval	1,548	X	[1]1,593	X
At least 50 percent of bill within interval	[1]1,482	[1]931	X	X
Any bill with admission date in interval	X	X		[2]1,286
Episode				
All bills in episodes beginning in interval without a service break of 60 days	[2]1,316	X	[1]1,426	X

[1] Restricted to Part A home health use.
[2] Service intervals analyzed in sections B and C.

SOURCE: Health Care Financing Administration and the Office of the Assistant Secretary for Planning and Evaluation, Department of Health and Human Services: Data from the 1982 National Long-Term Care Survey; Health Care Financing Administration, Bureau of Data Management and Strategy: Data from Medicare Statistical System.

case-mix dimensions identified. This means that, in GOM, the observed characteristics of any person are explained as a simple weighted sum of the characteristics of some number of the K case-mix dimensions. In factor analysis, these scores range from plus to minus infinity, therefore, the constraint does not apply. The constraints on the weights for individuals are what make GOM useful for generating the case-mix descriptions; because factor analysis, which does not have this constraint, is not appropriate for developing the case-mix measures.

In the GOM procedure, a person may be described by more than one continuously varying case-mix dimension. Because of this, GOM is distinct from the classification methodology used to identify the DRG categories for hospital reimbursement by which homogeneous discrete groups are defined in terms of the variation of a single criterion (i.e., charges or length of stay) except where clinical judgment was used to modify the statistically defined groups; and each case is assigned to exactly one group and thus does not represent individual heterogeneity in the classification.

We can describe the GOM model with a single equation. The equation indicates that each person's score on the *jth* observed variables (x_{ijl}) is composed of the sum of the product of that person's weights for each of the dimensions (g_{ik}'s) times the scores of the

dimension on the *jth* variable ($\lambda_{kj\ell}$). Verbally this can be written

$$\begin{bmatrix}\text{person's score}\\ \text{on variable}\end{bmatrix} = \text{the sum of} \quad \text{person's weight on dimension} \times \begin{bmatrix}\text{dimension's score}\\ \text{on variable}\end{bmatrix}$$

Using mathematical symbols the equation is

$$\hat{x}_{ij\ell} = \sum_{K} g_{ik}\, \lambda_{kj\ell}\,, \tag{1}$$

where

$x_{ij\ell}$ = the individual's score on the *jth* variable or attribute predicted by the model,
g_{ik} = an individual's weight on the *Kth* pure type (or group),
$\lambda_{kj\ell}$ = a dimension's score on the *jth* variable or attribute,
K = number of dimensions, and
j = number of variables (and ℓ is the number of different types of responses to the variable).

Each of the values defined in the model can be given a substantive interpretation. The score $\hat{x}_{ij\ell}$ represents the probability predicted by the model that the *ith* person has a particular attribute. The values of g_{ik} and $\lambda_{kj\ell}$ are selected so that the $x_{ij\ell}$ (the observed binary indicator values) and $\hat{x}_{ij\ell}$ (the predicted probability of each indicator) are as close as possible for a given number of case-mix dimensions, i.e., for a given value of K.

The product in (1) involves two types of coefficients. The first type are the scores $\lambda_{kj\ell}$. These are the probabilities that persons on the *Kth* dimension have response level ℓ for variable j. The set of these coefficients describes the substantive nature of each of the K analytically defined dimensions just as the set of factor loadings in a factor analysis describes the nature of the analytically determined factors. Thus, to describe the clinical characteristics of each of the K dimensions identified by the procedure, we need to determine if the attributes identified by the procedure as fitting a dimension are reasonably associated with one another.

A similar criterion (i.e., that the analytically defined groups be clinically meaningful) was employed in the creation of the DRG categories by using the expert judgment of physician panels. In the GOM analysis, the health and functional status variables are used directly in the statistical procedure to identify the case-mix dimensions. Of course, the GOM results could also be reviewed and modified by expert panels by one of the following:

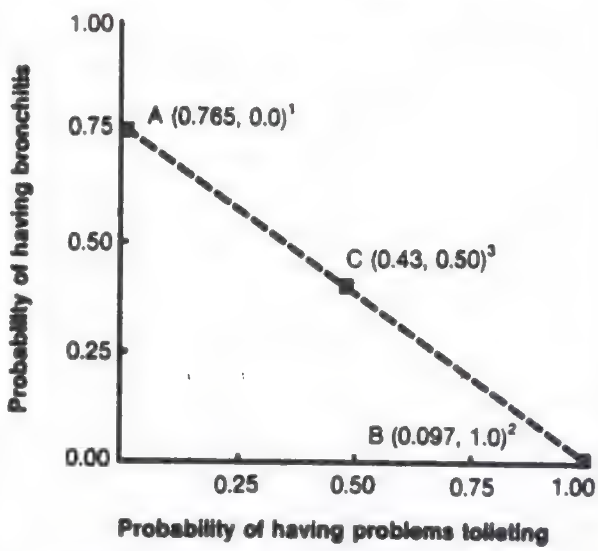
- Changing the distribution of the g_{ik}'s or altering the $\lambda_{kj\ell}$'s.
- Adding in additional variables to the GOM analysis to help objectively redefine the case-mix dimensions by increasing the scope of measures used in their definition.

The second type of coefficient or score are the g_{ik}'s. These scores describe how close the observed attributes of individual cases are to the profile of attributes (i.e., the pattern of $\lambda_{kj\ell}$'s) for each of the K case-mix dimensions. This score has the property that it must be between 0 and 1.0; and it must sum to 1.0 over the K dimensions for each case. As such, they can be used as linear weights to reproduce the observed attributes of each person as a composite of parts of the attributes associated with each of the K analytically determined profiles. These scores are the basis of our reimbursement formula.

Figure 1 is an illustration of how the two types of case-mix dimensions relate to 2 of 56 observed variables used in our analyses. (Table 3.) The vertical axis corresponds to the probability of having bronchitis, and the horizontal axis refers to the probability of having trouble toileting. Point A describes how the case-mix dimension characterized by multiple chronic problems relates to the two variables. Specifically, this dimension has a high probability of bronchitis (0.765) and a low probability of problems toileting (0.0). Point B refers to a second case-mix dimension, characterized by neurological problems, that has a high probability of problems toileting (1.0) and a modest probability of bronchitis (0.097). Point C refers to the probabilities predicted by the model for a specific person who has g_{ik}'s of 0.5 on both

Figure 1

The relation of case-mix dimensions to two observed variables



[1]A = Position of case-mix dimension characterized by chronic health problems relative to two observed variables.

[2]B = Position of case-mix dimension characterized by neurological impairments relative to two observed variables.

[3]C = Position of hypothetical patient with g_{ik} scores of 0.5 on each of the two case-mix dimensions relative to two observed variables. The values 0.43 and 0.50 refer to the probabilities of having either bronchitis or problems toileting predicted by the model.

dimensions. The predicted probabilities for each patient is a product of the weights (i.e, the g_{ik}'s) and the probabilities of each variable on each case-mix dimension.

An important parameter in the analysis is the number of case-mix dimensions (i.e., K). Because the coefficients are estimated using maximum likelihood procedures (Woodbury and Manton, 1982), the procedure provides a statistical criterion for selecting the best value of K. This criterion is a χ^2 value (calculated as twice the change in the log-likelihood function) describing the statistical significance of the $K+1$ dimension, i.e., whether the $\hat{x}_{ijl}$'s are closer to the x_{ijl}'s than could be expected by chance when the $K+1$ group is added. One continues to add dimensions until the $K+1$ dimension is no longer significant according to the χ^2 criterion.

Results

The first step in the identification of the case-mix dimension is the selection of the J variable on which we wish to differentiate cases and the estimation of the λ_{kjl}'s and g_{ik}'s. Because the case-mix measure is used to control differentials in need for services, we used data from the survey on both medical condition and functional status. From the survey, we selected 29 diagnosis-based measures of both longstanding conditions and medical events occurring in the past 12 months and 27 functional status measures (9 ADL's; 10 IADL's; and 8 measures of physical performance, sometimes referred to as IADL2 measures). GOM analyses were conducted with 29, 38, 48, and 56 health and functional status measures (Table 3) by adding in first the diagnostic variables and then successively the ADL, IADL, and IADL2 variables. The 56-variable GOM analysis produced case-mix measures that were best in terms of their ability to predict home health expenditures and numbers of visits. Extending the set of 56 variables by including such variables as scores on the Mini-Mental Status test, measures of behavioral problems, and selected demographic and economic factors did not improve the case-mix measures in terms of their power to predict home health reimbursements and visits. Thus, we used the set of 56 variables to define the functional and health status of persons relevant to home health use and used likelihood ratio tests to determine the value of K which satisfactorily explained the variation in those variables. We also added in the home health reimbursement and number of visits occurring during 1982 in an expanded 58-variable analysis. The results of the tests of the number of dimensions (K) needed to describe the systematic variation of the 56 variables are presented in Table 2.

In this table, we present several statistics. The first is the value of the log-likelihood function, which is the criterion that the model tries to maximize in fitting coefficients to explain the variation of the data. The importance of a dimension is tested by seeing how much the log-likelihood value changes when one

Table 2

Log-likelihood function, change in log-likelihood function, χ^2, and t-value for the 56 health and functional status variables, by dimension

Dimension	Log-likelihood function	Change in log-likelihood function	χ^2	t-value
5	5,357.7	0	0	0
6	5,824.8	467.1	934.2	2.9
7	6,182.8	358.0	716.0	−2.5

SOURCE: Health Care Financing Administration and Office of the Assistant Secretary for Planning and Evaluation, Department of Health and Human Services: Data from the 1982 National Long-Term Care Survey. Health Care Financing Administration, Bureau of Data Management and Strategy: Data from Medicare Statistical System.

additional dimension is added (column 3). Twice the change in the log-likelihood value is an χ^2 variable. For ease of interpretation, we present the value of the Fisher transform (i.e., $\sqrt{2_{\chi}{}^2-1} - \sqrt{2d.f.-1}$), which may be viewed as a normal variate for large degrees of freedom. Hence, a value of 1.96 for this statistic represents the 0.05-criterion level.

We can see that six dimensions are necessary and sufficient to explain the variation in the health and functional status measures (i.e., $Z=2.9 > 1.96$). The seventh dimension does not contribute a statistically significant amount to the prediction. Similar results were found for 58 variables. This means that all the variation in the 56 (or 58) variables that is not the result of correlations among the measures or sampling variability is summarized in the g_{ik}'s for the six dimension solution. As a consequence, coefficients estimated for the regressions predicting service use should be better defined (i.e., not unstable because of the high collinearity among the original measures) and more likely to replicate in independent samples (because multiple measures are used to define a more reliable health-status index) than coefficients in regressions using the original 56 health and functional measures. In addition, the structure of the GOM model can represent nonlinear relations that could not be described in a linear regression with the original variables.

Beyond the statistical advantages of the GOM scores used as LTC case-mix indexes, each of the scores is associated with a dimension of clinical characteristics. These dimensions can be evaluated by persons with clinical training and experience to determine if the set of health and functional status measures found in a given dimension either tend to occur with one another in patient populations or represent classes of conditions with similar levels of functional impairment.

Given that six is the statistically correct number of dimensions (i.e., satisfactorily explains the variation of the medical and functional measures), we need to examine the clinical characteristics asociated with each profile. Thus, we examined the λ_{kjl}'s in Table 3 to determine which attributes best categorize each dimension.

Table 3

Percent of disabled elderly persons with home health use, responding to the National Long-Term Care Survey (NLTCS), and in each of six analytically defined dimensions, by health and functional status

Health and functional status	With home health use	Responding to NLTCS[1]	Dimension 1	Dimension 2	Dimension 3	Dimension 4	Dimension 5	Dimension 6
			Percent of persons					
Health status								
Chronic conditions								
Neurological:								
Parkinson's disease	4.12	2.63	0.0	0.0	9.01	10.99	0.0	5.03
Multiple sclerosis	0.95	0.59	0.0	1.86	0.0	0.03	0.0	4.15
Cerebral palsy	0.79	0.46	0.87	0.0	0.0	0.0	0.0	4.07
Epilepsy	0.63	0.79	0.0	0.0	0.0	1.72	0.0	2.55
Paralysis	16.96	9.33	0.0	17.73	0.0	0.0	0.0	100.0
Permanent numbness	27.26	24.41	0.0	25.20	0.0	0.0	100.0	66.17
Complications (i.e., have numerous effects):								
Rheumatism and arthritis	66.72	73.26	30 22	100.0	7.78	68.89	100.0	85.97
Diabetes	24.72	16.66	14.26	13.37	0.0	39.93	69.87	42.82
Frequent constipation	38.35	33.48	9.83	35.41	0.0	22.15	100.0	72.45
Frequent insomnia	46.28	42.05	16.70	44.55	0.0	41.77	100.0	64.92
Obesity	15.37	23.52	7.15	24.33	0.0	7.33	68.77	0.0
Mental retardation	3.49	1.84	0.0	0.0	0.0	0.0	0.0	26.33
Senility	14.42	9.20	0.0	0.0	0.0	0.0	0.0	100.0
Miscellaneous:								
Cancer	11.89	6.41	17.63	0.0	37.21	0.0	0.0	5.73
Glaucoma	9.51	8.64	0.0	0.0	0.0	45.49	0.0	16.62
Arteriosclerosis	38.03	31.44	11.48	0.0	0.0	53.61	100.0	100.0
Conditions experienced in last 12 months								
Stroke	16.96	6.60	0.0	0.0	0.0	0.0	0.0	100.0
Circulatory, heart:								
Heart attack	12.84	6.24	0.0	0.0	0.0	0.0	79.55	0.0
Other heart	35.82	29.07	12.27	0.0	0.0	47.11	100.0	41.06
Hypertension	47.07	47.11	23.55	49.93	0.0	43.95	100.0	74.03
Circulatory trouble in arms and legs	56.42	52.43	18.13	54.28	0.0	51.88	100.0	100.0
Respiratory:								
Acute								
Pneumonia	8.87	5.68	3.42	0.0	0.0	0.0	41.51	15.88
Influenza	11.09	16.98	2.27	8.83	0.0	0.0	56.91	10.13
Long term								
Bronchitis	11.09	12.88	0.0	0.0	0.0	0.0	78.51	9.72
Emphysema	11.41	9.86	12.55	0.0	8.86	0.0	50.49	0.0
Asthma	5.71	7.88	0.0	0.0	0.0	0.0	42.49	5.57
Fractures								
Broken hip	7.61	2.30	0.0	30.48	6.34	0.0	0.0	9.21
Other broken bones	9.19	5.55	0.0	31.50	17.17	0.0	0.0	3.43
Functional status[1]								
Activity of daily living								
Bathing	69.89	42.54	0.0	100.0	100.0	100.0	100.0	100.0
Dressing	44.06	21.02	0.0	0.0	100.0	0.0	0.0	100.0
Getting to or using toilet	42.63	19.71	0.0	41.60	100.0	0.0	0.0	100.0
Eating	15.85	6.31	0.0	0.0	0.0	0.0	0.0	100.0
Instrumental activity of daily living								
Doing heavy work	88.27	76.15	29.39	100.0	100.0	100.0	100.0	100.0
Grocery shopping	80.98	63.29	0.0	100.0	100.0	100.0	100.0	100.0
Laundry	70.21	46.42	7.89	48.97	100.0	98.10	100.0	100.0
Preparing meals	59.11	33.77	0.0	0.0	100.0	100.0	100.0	100.0
Doing light work	47.54	29.93	0.0	0.0	100.0	0.0	0.0	100.0
Taking medicine	47.39	25.16	0.0	0.0	100.0	100.0	0.0	100.0
Managing money	46.59	28.75	0.0	0.0	84.70	100.0	0.0	100.0
Making telephone calls	29.00	19.05	0.0	0.0	0.0	62.69	0.0	100.0

See footnotes at end of table.

Table 3—Continued

Percent of disabled elderly persons with home health use, responding to the National Long-Term Care Survey (NLTCS), and in each of six analytically defined dimensions, by health and functional status

Health and functional status	With home health use	Responding to NLTCS[1]	Dimension 1	2	3	4	5	6
			Percent of persons					
Mobility								
Getting around outside	82.25	62.48	0.0	100.0	100.0	100.0	100.0	100.0
Going places outside of walking distance	79.56	60.74	0.0	100.0	100.0	100.0	100.0	100.0
Getting around indoors	65.77	50.11	0.0	100.0	100.0	100.0	100.0	100.0
Getting in or out of bed	53.25	25.85	0.0	100.0	100.0	0.0	100.0	100.0
Wheelchair fast	9.51	3.32	0.0	0.0	0.0	0.0	0.0	57.22
Does not get around inside at all	5.07	1.45	0.0	0.0	0.0	0.0	0.0	37.45
Bedfast	3.65	0.82	0.11	0.0	0.0	0.0	0.0	25.66
Detailed functional status								
Mobility:								
Difficulty climbing stairs								
No difficulty	6.42	16.65	27.88	0.0	0.0	0.0	0.0	0.0
Some difficulty	21.70	27.25	72.12	0.0	0.0	30.25	0.0	0.0
Very Difficult	30.94	34.52	0.0	69.48	0.0	66.94	51.15	0.0
Unable to at all	40.94	21.58	0.0	30.52	100.0	2.81	48.85	100.0
Physical:								
Difficulty lifting and holding a 10-lb. package								
No difficulty	11.76	26.63	52.20	0.0	0.0	0.0	0.0	0.0
Some difficulty	12.44	17.77	36.11	27.74	0.0	0.0	0.0	0.0
Very difficult	13.95	17.56	11.69	34.75	0.0	47.09	0.0	0.0
Unable to at all	61.85	38.04	0.0	37.51	100.0	52.91	100.0	100.0
Difficulty reaching above head								
No difficulty	41.69	52.30	100.0	100.0	0.0	0.0	0.0	0.0
Some difficulty	22.52	22.66	0.0	0.0	59.43	100.0	0.0	0.0
Very difficult	19.49	15.08	0.0	0.0	40.57	0.0	80.41	16.50
Unable to at all	16.29	9.96	0.0	0.0	0.0	0.0	19.59	83.50
Difficulty grasping and handling small objects								
No difficulty	57.39	65.38	100.0	90.87	75.26	47.89	6.68	0.0
Some difficulty	21.78	20.09	0.0	9.13	24.74	52.11	29.97	21.43
Very difficult	13.83	10.79	0.0	0.0	0.0	0.0	63.35	34.39
Unable to at all	7.00	3.75	0.0	0.0	0.0	0.0	0.0	44.18
Can see well enough to read newsprint with glasses	62.60	73.49	100.0	100.0	100.0	0.0	62.98	0.0
Activity of daily living:								
Difficulty bending for socks								
No difficulty	27.05	40.86	100.0	0.0	0.0	0.0	0.0	0.0
Some difficulty	23.21	28.59	0.0	75.07	0.0	100.0	0.0	0.0
Very difficult	23.37	20.18	0.0	24.93	12.88	0.0	100.0	0.0
Unable to at all	26.38	10.37	0.0	0.0	87.12	0.0	0.0	100.0
Difficulty brushing or combing hair								
No difficulty	52.23	68.86	100.0	100.0	0.0	37.58	0.0	0.0
Some difficulty	19.75	17.63	0.0	0.0	39.01	62.42	53.19	0.0
Very difficult	12.26	7.74	0.0	0.0	60.99	0.0	46.81	0.0
Unable to at all	15.76	5.77	0.0	0.0	0.0	0.0	0.0	100.0
Difficulty washing hair								
No difficulty	29.41	52.84	100.0	77.68	0.0	0.0	0.0	0.0
Some difficulty	14.15	16.53	0.0	22.32	0.0	71.83	0.0	0.0
Very difficult	11.13	9.64	0.0	0.0	0.0	0.0	100.0	0.0
Unable to at all	45.31	20.99	0.0	0.0	100.0	28.17	0.0	100.0

[1] Based on the Long-Term Minimum Data Set, National Center for Health Statistics.

NOTE: Based on a 50-percent random sample of respondents.

SOURCE: Health Care Financing Administration and Office of the Assistant Secretary for Planning and Evaluation, Department of Health and Human Services: Data from the 1982 National Long-Term Care Survey; Health Care Financing Administration, Bureau of Data Management and Strategy: Data from Medicare Statistical System.

In the table, descriptions of the variables are presented in the first column on the left. Contained in the second column are the percent of the disabled elderly with home health use that have the specified attribute. In the third are the percent of the total elderly disabled population that responded to the NLTCS who had the attribute. We see that persons with home health reimbursements are generally sicker and frailer (e.g., 3.65 percent of the home health group are bedfast compared with only 0.82 percent of the total surveyed population). The next six columns contain the probability of having each medical and functional attribute for each of the six dimensions (i.e., the λ_{kjl}'s). The six dimensions can be characterized as follows:

- Dimension 1 includes people with limited and uncomplicated medical problems (e.g., above average amounts of cancer, average amounts of emphysema, below average amounts of diabetes and heart trouble) but little chronic disability.
- Dimension 2 includes people affected by musculoskeletal problems. People in this dimension have the highest proportion of hip and other fractures. In addition, they have serious problems with arthritic and other degenerative joint problems. These people also have IADL mobility limitations—though probably of short duration. No cognitive problems are indicated.
- Dimension 3 includes people with acute, serious medical problems. The most distinctive characteristic of people in this dimension is their high likelihood of cancer. There is some risk of Parkinson's disease and some hip fractures. The dimension has people with serious ADL, IADL, and IADL2 restrictions. There are problems with managing money and medication but not with using the telephone, suggesting that these limitations are not because of cognitive impairments.
- Dimension 4 includes people with primarily chronic medical conditions (though few acute, serious problems) and IADL problems, including those involving cognitive tasks but with few ADL problems.
- Dimension 5 includes people with a combination of chronic and acute circulatory and respiratory problems. The collection of conditions suggests that it represents persons at different stages of circulatory degeneration involving chronic risk factors (e.g., diabetes, hypertension), acute circulatory events (e.g., heart attack), and associated respiratory complications. Though persons scoring high on the dimension are quite ill with several ADL limitations and IADL limitations, none imply cognitive impairment.
- Dimension 6 includes people who are neurologically impaired and chronically morbid. People in this dimension, like those in dimension 4, have a high prevelance of specific medical problems, but they seem to be most distinguished by a high prevalence of dementia and stroke as well as less common forms of neurological impairment. They also have the greatest level of functional impairments, including limitations suggesting cognitive impairment (e.g., managing money and telephoning), as well as the only significant probabilities of being bedfast, wheelchair-fast, and not getting around inside at all.

Several of the dimensions (e.g., 4, 5, and 6) are strongly characterized by multiple conditions and impairments. These conditions are grouped together either because of their tendency to occur with one another or because they produce similar levels of impairment. As a consequence, these case-mix measures can describe the increased service needs of a patient with multiple interacting medical problems—a type of geriatric patient that case-mix measures based upon discrete groups will generally have difficulty describing. The GOM dimensions do not represent all or nothing assignments to specific clinical categories. Thus, the fact that a large number of medical conditions are associated with a given dimension does not mean that we would expect any individual strongly characterized by that profile to have all of those conditions. The g_{ik}'s produced in the GOM solution allow a person to be described by some combination of, say, the attributes in dimension 1 (i.e., the dimension with limited and uncomplicated medical problems and with few chronic functional limitations) and dimension 4. Thus, the g_{ik}'s provide the flexibility to describe the complex but varying patterns of morbid conditions that emerge in very elderly patients. Reflecting the mixed clinical picture, the reimbursement would be a weighted combination of the reimbursement for these two dimensions.

In including both functional status and medical conditions in forming the dimensions, we include variables that determine both the intensity and chronicity of need for services. For example, the functional status of the person may better predict the intensity of need for certain types of services; and the medical conditions may be more predictive of the amount of time the service may be required, the likelihood of rehabilitation (e.g., hip fracture vs. cancer), and the likely future course of change in functional and health status. Thus, in a sense, the description of the state of the individual represented by these case-mix measures implies something about the change in the mix of service needs of a chronic care patient, possibly with multiple medical problems, over a significant period of time.

The six dimensions were reviewed by several physicians at Duke University Medical Center and were found to be clinically meaningful, though no formal evaluation by a physician panel has been conducted yet. We can also examine how those dimensions are associated with variables that were not used to define the dimensions. The probabilities that a given dimension is characterized by a particular variable are presented in Table 4.

The clinical nature of the dimensions seems consistent with these independent variables. Persons in dimensions 4 (with multiple chronic conditions and serious IADL's) and 6 (neurologically impaired with multiple acute medical problems and profound

Table 4

Percent of disabled elderly persons with home health use and percent in each of six dimensions, by demographic characteristics

Demographic characteristic	With home health use	Dimension 1	2	3	4	5	6
	Percent of persons						
Sex							
Male	32.33	49.68	10.08	44.96	28.73	0.0	45.08
Female	67.67	50.32	89.92	55.04	71.27	100.00	54.92
Age							
65-69 years	15.21	8.23	7.86	30.79	8.33	24.80	9.86
70-74 years	18.54	26.97	18.91	17.23	0.0	25.31	18.06
75-79 years	23.14	30 56	21.63	23.93	5.36	43.55	7.80
80-84 years	22.35	22.73	27.41	15.70	37.01	6.35	28.08
85-89 years	14.26	11.51	19.24	1.85	34.40	0.0	24.64
90 years or over	6.50	0.0	4.95	10.51	14.90	0.0	11.56
Mean age of group	0.00	77.6	79.8	76.1	84.2	74.1	81.2
Marital status							
Married	41.52	44.91	17.37	60.44	28.29	52.28	42.16
Not married	58.48	55.09	82.63	39.56	71.71	47.72	57.84
Education							
None	6.34	1.65	3.08	5.44	7.88	3.90	18.15
Grade school	18.07	12.24	8.07	7.52	38.15	25.81	25.75
Junior high	32.01	27.52	38.42	26.40	29.39	49.89	24.42
Senior high	29.48	45.32	28.41	43.99	9.24	18.79	18.51
College	12.84	13.03	19.41	16.65	15.34	1.61	8.19
Graduate school	1.27	0.24	2.61	0.0	0.0	0.0	4.97
Income							
Less than $5,000	15.06	18.71	20.18	0.0	10.21	32.14	14.89
$5,000-$6,999	12.68	13.10	23.33	2.58	15.58	18.24	8.37
$7,000-$9,999	18.07	9.51	19.27	18.82	9.29	27.75	25.42
$10,000-$14,999	16.96	21.04	9.31	29.16	5.65	7.01	19.23
$15,000-$29,999	10.46	8.84	3.00	14.84	14.80	0.43	19.98
$30,000 or more	5.55	5.33	4.11	6.86	12.81	0.0	4.92
Refused to answer	6.81	5.97	12.56	4.61	11.51	6.25	2.04
Don't know	14.42	17.51	8.24	23.14	20.15	8.17	5.15
Works 30 hours per week							
Yes	0.16	0.01	0.40	0.34	0.91	0.22	0.06
No	99.84	99.99	99.60	99.66	99.09	99.78	99.94
Has been hospitalized							
Yes	69.89	57.02	74.15	70.73	55.15	96.35	71.90
No	30.11	42.98	25.85	29.27	44.85	3.65	28.10
Hospital reimbursement							
None	16.01	7.82	22.07	10.79	22.32	5.08	28.84
Less than $3,071	20.44	28.07	17.91	10.74	23.04	35.09	13.12
$3,071-$5,750	20.60	23.06	22.48	25.03	17.47	8.87	21.03
$5,751-$10,110	19.18	23.19	13.67	24.54	13.25	26.07	13.67
$10,111-$19,820	17.12	13.63	21.06	12.63	23.92	22.78	12.08
$19,821 or more	6.66	4.22	2.80	16.27	0.0	2.10	11.26
Number of informal caregivers							
None	11.73	39.41	13.86	2.67	0.0	10.40	0.0
1	46.43	43.41	40.82	47.12	44.67	57.91	48.22
2	24.56	15.94	28.21	25.25	17.34	29.06	23.66
3	9.83	1.23	10.21	11.46	15.56	0.0	19.98
4 or more	7.45	0.0	6.90	13.50	12.43	2.63	8.18
Number of home health visits							
Less than 5	19.33	26.84	31.16	20.59	15.81	12.18	2.67
6-15	24.88	38.43	17.36	24.75	37.66	21.11	5.03
16-30	19.97	20.46	19.22	8.70	23.85	33.51	19.86
31-65	16.16	8.04	21.11	23.74	14.79	15.40	12.27
66 or more	19.65	6.23	11.15	22.22	7.90	17.80	60.17

SOURCE: Health Care Financing Administration and Office of the Assistant Secretary for Planning and Evaluation, Department of Health and Human Services: Data from the 1982 National Long-Term Care Survey.

impairment) are the oldest (i.e., mean age 84.2 years and 81.2 years, respectively). Those in dimension 5 (multiple circulatory and respiratory problems) are relatively young (mean age 74.1 years), probably reflecting poor survival, but consistent with a lower level of ADL impairment. Persons in dimensions 3 and 6 have the largest number of informal caregivers, and those in dimension 3 (with the highest cancer risk) have high hospital expenditures. Thus, the pattern of conditions represented by the dimensions seems reasonably associated in terms of medical diagnoses, functional status, and in terms of these external criteria.

We also conducted a GOM analysis where we used home health reimbursement and the total number of home health visits in addition to the 56 health and functional status measures to define the six groups. Though the six sets of coefficients (λ_{kjl}'s) for the 56 health and functional status variables were generally similar in the two analyses, there were a few significant differences. The most significant was f[illegible] the fourth and fifth dimensions. The health profile of persons in dimension 4 was altered most with the emergence of a strong association with stroke (43.5 percent) and dementia (39 percent) along with more atherosclerosis, less glaucoma, and more epilepsy, obesity, constipation, and insomnia. This dimension, which has more persons with neurological impairments and less with acute medical problems than in the analyses of only the health and functional measures, also turns out to have persons with much lower levels of home health reimbursement. Because dementia and long-term stroke effects are unlikely to be reversed or significantly diminished in a very elderly population, it seems reasonable that the home health benefits for such a population should be low if that population does not have many serious acute medical problems. Thus, the introduction of the cost measures in the GOM analysis helped clarify the health and functional status profile of a dimension, and it provides a guide for further development of case-mix measures. The fifth dimension was modified primarily in terms of a reduction in certain ADL measures that made it more purely an acute medical problem dimension (e.g., the mean age of people in this dimension was even lower, 73.9 years).

Estimation of reimbursement levels

Methods

Once the case-mix dimensions are formed using the GOM methodology, the reimbursement level for each is estimated. This is done by regressing the g_{ik}'s (and other relevant covariates) on the level of reimbursement for the *ith* case. Symbolically this may be represented as,

$$\text{Costs or visits} = \left[\text{Rate for a given case-mix dimension} \times \text{Score on case-mix dimension}\right] + \left[\text{Reimbursement adjustment for a covariate} \times \text{Covariates (e.g., hospital use, demographics, State of residence)}\right] \quad (2)$$

or,

$$\text{Reimb}_i = B_l g_{ik} + \beta_c X_{ic} + e_i.$$

Where the g_{ik} are the K scores or weights obtained obtained for the *ith* person in the GOM analysis, e_i's are errors in prediction, and the X_{ic}'s are the individual values (when included) on the relevant covariates. The regression coefficients, B_k's represent the amount that should be reimbursed for a person exactly described by the *Kth* dimension, i.e., for a person who has a $g_{ik} = 1.0$ for that dimension. Because a person can belong, potentially, to more than a single dimension, reimbursement can vary continuously between the bounds established by the B_k, i.e., a person can have a reimbursement that is a weighted combination of two or more B_k's where the g_{ik}'s are the weights. Although the g_{ik}'s are constrained to be less than 1.0, a reimbursement can never be higher than the B_k for the most expensive case-mix dimension. The coefficient β_c represents how much reimbursement should be changed for certain characteristics represented by geographic and other health-service use covariates.

Determining reimbursements in this way has several useful properties. First, the reimbursable amount can be continuously adjusted, through the g_{ik}, to represent differences on all the variables summarized in the definition of the K dimensions.

A second important property of the GOM approach is that the dimensions are designed to explain individual differences in clinical and functional characteristics. In the DRG system, because groups are defined on their ability to predict costs (or lengths of stay), group definitions are dependent on the historical pattern of charges or service use. A reliance on historical charges was a necessary limitation of the data in calculating case-mix weights for acute hospital care. It is potentially a greater problem for LTC reimbursement, where such charges are less well established and often confounded with local market conditions and State regulations.

In our initial analyses, service use was not used to define the dimensions. Thus, the first set of case-mix dimensions was defined only on medical and functional needs. Therefore, if reimbursements have not appropriately been made, this will not confound the definition of the dimensions though individual costs will be difficult to predict from the case-mix scores. If the dimensons are clinically meaningful, the appropriateness of the current reimbursements can be evaluated by the level of predictability of costs. Furthermore, because changing reimbursement levels would not change the case-mix definitions, the case-mix scores could be used to analyze different reimbursement structures and levels.

In the current analysis, we also wished to compare the price levels for case-mix dimensions defined solely on health and functional status with case-mix dimensions where service-use measures have been added in. To do this, in GOM, we included service-

use measures in the definition of the K dimensions by adding them to the set of J variables used to define the dimensions. In this way, reimbursement and service variables were objectively combined with the health and functional status measures used to represent the interaction between the health and service variables. Including the reimbursement measures in the definition of the case-mix dimensions, however, makes them functionally related to the outcome measures. Analyses of such augmented sets of composite health measures can be useful to identify the effects of currently unmeasured variables. This is accomplished by examining how the profile of health and functional measures for each case-mix dimension was altered when service use measures were introduced. The changes in the dimensions were described earlier.

In addition to the medical and functional need variables summarized in the g_{ik}'s, one can also add adjustment factors to equation (2) in order to represent nonmedical dimensions (i.e., the X_{ic}). For example, a variable representing metropolitan versus nonmetropolitan residence could be used as a proxy measure for cost differentials between the two types of areas. This can be done either additively (i.e., simply include a dummy variable in the regression for metropolitan residence) or interactively (i.e., enter in the product of metropolitan residence with each g_{ik} to represent the fact that delivering certain packages of services is more expensive in certain areas). In this way, we can determine how much of the cost variation is the result of nonmedical factors (i.e., examine the coefficients for the nonmedical factors) and how much that nonmedical cost variation affected the differentials between the dimensions (i.e., examine the increase or decrease in the B_k after adding the nonmedical factors to the equation).

One final use of this procedure is to make comparisons across populations. For example, given that the g_{ik} estimates are from a national population, they should be representative of the distribution of characteristics determining the use of home health services. In addition, data may be available from demonstration projects that relate more detailed service use measures to the same basic health and functional status measures used to generate the g_{ik}'s from the national sample. In this case, the g_{ik}'s can be estimated for the demonstration populations using the λ_{kjl}'s estimated from the national study. We can then regress these constructed g_{ik}'s on local service-use measures and determine a new set of case-mix rates (B_k's). These rates can be applied to the distribution of the g_{ik}'s in the national survey data. Because the scores (g_{ik}'s) from the demonstration and national samples are related to the same case-mix dimensions (because the λ_{kjl}'s are the same), the blending of the rates (B_k's) with the g_{ik} statistically controls for all of the health and functional measures used to calculate the g_{ik}'s. In a similar way, we can examine the level of use among persons currently receiving a benefit and extrapolate that use to the nonbeneficiary population. This provides estimates of the resources required if the benefits were used more generally by persons with comparable health and functional problems.

In addition to the 56 variables presented in Table 3 used to define health and functional status in the GOM analysis, we used the 15 other measures described in Table 5 with the case-mix measures in our regressions.

These variables control for factors such as informal care days delivered per week and use of nonhome health services (e.g., out-of-pocket payments, SNF use). Some service-use variables (e.g., hospital reimbursement) also serve as proxies of the intensity of medical need for people who were not chronically disabled and, consequently, did not respond to the survey. Finally, we also used dummy variables to represent State differences in home health service use and reimbursement.

In addition to the standard measures of service use, we also employed interaction variables. These variables were designed to determine whether a person with a given set of health or functional problems consumed different amounts of home-health services depending on the amount of hospitalization or institutional care he received. Thus, hospital costs (from Medicare Part A) multiplied by the score (g_{ik}) for health-status dimension 2 (e.g., in Table 4, this represents a hip fracture dimension) describe the effect on home health expenses of increases in hospital costs for persons with a certain level (i.e., value of g_{i2}) of impairments and health problems of the second dimension. Actually, interactions with all six of the health and functional status dimensions were evaluated, but only those with significant effects were included in our analyses.

Table 5

Summary list of service-use measures and socioeconomic variables used in the regressions on service use

Acute and long-term care service-use measures (1982-1983)
Skilled nursing facility bills
Hospital costs
Number informal caregiver days
Out-of-pocket payment
Unmet instrumental activities of daily living service needs
Unmet activities of daily living service needs
Interaction of health and functional status indexes with service use
Hospital costs × score for Type 2
Hospital costs × score for Set 2
Skilled nursing facility bills × score for Type 5
Skilled nursing facility bills × score for Type 4
Socioeconomic measures
Age
Marital status
Sex
Race
Income
State of residence
Dummy variables representing all States

Results: Capitation

In this section, we analyze the use of home health services for 1,286 persons with either Part A or B bills who had an admission date in 1982. For persons who were not in the household survey, we did not have g_{ik} estimates. Because such persons failed to pass the telephone screen for disability, we know that they did not report disabilities of 90 days duration or more. We, however, do not have direct information on their medical status except for their use of hospitals and SNF's (from the Part A records). To include them in our reimbursement analyses, we treated them as a homogeneous seventh dimension with all of their g_{ik}'s for that seventh dimension set equal to 1.0 (given the GOM model logic, they must have zeros for all other g_{ik}'s). This is identical to including them in the regression with a dummy variable to indicate that they were in their own subgroup. Clearly, our R^2 will be lower than it would be if we had g_{ik} estimates for these people. We also defined a separate eighth group of 47 persons who used home health services and were identified as disabled on the screen but for whom g_{ik}'s could not be calculated because of missing survey data.

The regression for the logarithm of home health costs and visits are presented in Table 6.

In these regressions, we truncated the distribution of the measures of service use at two standard deviations from the predicted reimbursement to simulate the risk limiting effect of the special day and cost outlier payments made in the DRG prospective reimbursement system. Technically, this was done in two stages where a regression was run to determine the two-standard deviation bound around the regression line, and a second regression was run with cases that fell beyond this bound adjusted back to the value of the two-standard deviation limit at that point on the predicted regression line. Depending on the spread of the distribution, this improved the R^2's moderately (the effect is moderate because the logarithmic transform also served to reduce the variation due to extreme outliers). Moreover, this truncation procedure produced R^2 estimates that more accurately reflect the risk to home health providers (i.e., outlier reimbursement means that costs beyond the two standard deviation limits will involve special payments) and eliminates variation resulting from statistically deviant cases (i.e., the usual reason for adjusting outlier cases in statistical analyses). The rationale for such a truncation is that the lower weighted amounts can be paid, and the savings in paying those lower amounts can be held in a reserve account to distribute to agencies for cases that go beyond the two-standard deviation values or reimbursements. As an incentive for cost containment on outlier payments, the agency might be reimbursed, say, only 80 percent of the outlier costs to reflect possibly cheaper chronic care visits. An exact payment mechanism would be based on more detailed studies of the nature and costs of different types of home health visits, the nature of visits used by different case-mix groups, and whether the mix of visits for a given type of patient changes over time.

The first step in evaluating these equations is to examine the differences in the B_k between the eight different health status measures. Because we used the logarithm of the costs and visits variables, we provide both the unlogged coefficient that represents the reimbursement amount for persons exactly in a group and the coefficient from the logarithmic equation (in parentheses). These coefficients should be examined to determine if the reimbursement differentials are large enough to provide incentives to respond appropriately to the groups with high service needs and if the level of service is adequate for the needs manifest by persons in different groups.

In Table 6, we see that the cost differences between the dimensions are large—over 6 to 1 between the lowest ($751, dimension 4) and highest ($4,637, dimension 6) use dimensions for total reimbursement and 5½ to 1 for the number of visits. We also see that the reimbursement levels for dimensions 1, 2, and 4 for those without disabilities (set 2) are similar in terms of total reimbursement ($900, $900, $751, and $782) and visits (22.5, 28.8, 20.9, and 21.6). The relatively low cost of the hip fracture dimension ($900) probably reflects rapid rehabilitation. The cancer dimension is highly debilitated, and more expensive ($1,544) than the fifth, cardiovascular, dimension ($1,454), which has few ADL problems. The sixth dimension has the greatest reimbursement level ($4,637). This is probably because these persons qualify for the home-health benefit as a result of an acute medical episode, but they have longer chronic care needs because of their comorbid conditions and cognitive impairment. The 47 persons who passed the disability screen but who did not complete the interview have fairly high expenditures ($1,121), reflecting the likelihood that they probably did not complete the interview because of health problems. Thus, the reimbursement levels for the eight categories of home health beneficiaries seem to be reasonable in terms of their medical and functional characteristics, and they reflect significant differentials in reimbursement for persons in very different functional and health states.

It should be noted that the R^2's for the equations without covariates (16.8 and 14.8 percent) are highly significant. The R^2 values are calculated from the correlation of the predicted value from the regression function, after it has been unlogged, with the observed value of the dependent variable in its original metric. Thus, it reflects the ability of the regression equation to describe variations in the original service use measure. Furthermore, the differences between the B_k's for different dimensions are highly significant, and the equations are predicting individual costs that are much more difficult to predict than the aggregate reimbursement of a home health agency would be. It should also be remembered that we are predicting costs over a long period of time and not for specific episodes, and that we have only partial information on many of the home health

Table 6

Expected home health agency reimbursement costs and number of home health visits for different case-mix dimensions with and without covariates, by selected variables

Variable	HHA[1] reimbursements: Without covariates	HHA[1] reimbursements: With covariates	HHA[1] visits: Without covariates	HHA[1] visits: With covariates
R^2	16.8	25.3	14.8	25.0
Case-mix dimensions (g_{ik}'s)				
Type 1, Acute problem	$900	$781	22.5	28.5
	(6.16)	(6.13)	(2.47)	(2.82)
Type 2, Hip and other fracture	900	750	28.8	33.8
	(6.16)	(6.09)	(2.72)	(2.99)
Type 3, Cancer	1,544	1,738	41.8	58.8
	(6.70)	(6.93)	(3.09)	(3.70)
Type 4, Chronic medical problem	751	750	20.9	28.8
	(5.98)	(6.09)	(2.40)	(2.83)
Type 5, Acute medical problem	1,454	964	47.6	40.5
	(6.64)	(6.34)	(3.22)	(3.17)
Type 6, Multiple problems and neurological impairment	4,637	4,585	114.6	167.4
	(7.80)	(7.90)	(4.10)	(4.59)
Set 1, Incomplete survey	1,121	1,154	31.6	45.6
	(6.38)	(6.52)	(2.81)	(3.29)
Set 2, Not chronically disabled	782	773	21.6	30.0
	(6.02)	(6.12)	(2.43)	(2.87)
Service use (percent change in price)				
SNF[2] bills	—	-2.8	—	-6.3
SNF[2] bills × Type 5	—	1.5	—	16.0
SNF[2] bills × Type 4	—	-17.4	—	-25.0
Hospital costs (per $1,000)	—	1.9	—	1.9
Hospital costs × pure Type 2 (per $1,000)	—	2.5	—	1.4
Hospital costs × Set 2 (per $1,000)	—	-0.1	—	-0.3
Number of informal caregiver days	—	-1.8	—	-1.9
Out-of-pocket payment for long-term care (per $1,000 per year)	—	-1.4	—	-1.3
Unmet activity of daily living	—	-3.8	—	-33.9
Unmet instrumental activity of daily living	—	6.2	—	8.9
Sociodemographic				
Age	—	0.4	—	0.4
Marital status	—	4.4	4.0	—
Male	—	10.4	—	10.1
Income per $1,000	—	-0.4	—	-0.5
Black	—	2.5	—	19.5
State of residence controls	—	(3)	—	(3)
$\bar{x}$	1,133.6	1,127.0	31.5	31.6
Range:				
Predicted	410.2 to 2,485.2	133.1 to 4,481.3	11.0 to 62.9	2.6 to 108.9
Observed	34.7 to 17,827.6	27.5 to 15,737.0	1.0 to 356.0	1.0 to 315.0

[1] Home health agency.
[2] Skilled nursing facility.
[3] Numbers and coefficients not presented.

NOTE: Figures in parentheses are log values.

SOURCES: Health Care Financing Administration and Office of the Assistant Secretary for Planning and Evaluation, Department of Health and Human Services: Data from the 1982 National Long-Term Care Survey; Health Care Financing Administration, Bureau of Data Management and Strategy: Data from the Medicare Statistical System.

beneficiaries. Even with these limitations and without including service measures in the case-mix definition, our ability to predict home health service use at the individual level is significantly better than the ability of DRG's to predict individual hospital costs for medical (e.g., from 6 to 9 percent) and psychiatric (e.g., from 5 to 10 percent) problems in some studies (e.g., Morrison et al., 1985).

In establishing the reimbursement mechanisms for DRG's, adjustments were made for economic and other factors (e.g., State of residence) that could impact costs. The analyses with additional sets of nonhealth and economic status variables are also included in Table 6.

We see that the addition of these additional variables greatly increased the R^2 (to 25.3 and 25.0 percent). The introduction of the covariates affected the reimbursement for dimension 5 most strongly, reducing it by almost one-third. Reimbursement for the third dimension (cancer) increased moderately, and the first two dimensions decreased. The rates for the other dimensions were relatively unaffected by the

introduction of the covariates. In interpreting the regression coefficients for the other covariates, we must remember that we are dealing with a logarithmic dependent variable. Consequently, these coefficients represent the percent change in the reimbursement level that change in the covariate would cause. For example, the fact of the visit to a SNF would reduce the reimbursement level by 2.8 percent—probably because of a shortening of the period of home health use by a visit to a SNF. The interaction variables (i.e., SNF x dimension 5 and SNF x dimension 4) show that a SNF visit has a much different effect on home health service use for people strongly characterized by these two types of health problems. In particular, persons in dimension 4 (chronic medical conditions) who have a SNF visit have a 17.4- percent lower home health reimbursement. This is probably because persons in this dimension have a greater likelihood of remaining in a SNF because of the chronic nature of their medical problems.

We see that hospital reimbursement, which can be viewed as a proxy measure for the severity of the medical problem, increases home health expenses 1.9 percent for each $1,000 of expenses in the hospital. This reimbursement effect is much larger for persons with hip fractures (i.e., dimension 2) producing a 4.4-percent increase per $1,000 (i.e., 1.9 + 2.5 = 4.4 percent) for persons in dimension 2. Having greater amounts of LTC (i.e., number of informal caregiver days and out-of-pocket payments) decreases home health reimbursements as does unmet ADL limitations—possibly reflecting situations where home health is an inadequate service option. In contrast, unmet IADL needs increase home health reimbursement 6.2 percent. Of the social and demographic variables, marital status and sex are most important.

In the equations for the total number of home health visits, we see that certain of the covariates have a larger effect than in the cost equation. Specifically, the effect of SNF use has a greater effect on visits than costs (especially for dimension 5). This probably occurs because the different types of home health visits are differently affected by SNF use—in particular it appears that the more expensive home health visits (for more acute medical problems) are more likely to be reduced by SNF use. For visits we also see a much larger effect of current ADL's (−33.9 percent versus −3.8 percent) and being black (+19.5 percent versus 2.5 percent) than in the cost equation.

On the bottom of Table 6, we also presented the minimum and maximum levels of reimbursement—both as observed for these cases and as calculated from the function in the table (i.e., the simulated reimbursement payment). The amount actually paid ranged from $34.70 to $17,827.60. The amount the function suggested to pay ranged from $410.20 to $2,485.20.

In Table 7, the same sets of coefficients are presented as in Table 6 except that the g_{ik}'s for the six dimensions are calculated with 58 variables, i.e, the 56 health and functional variables and home health costs and visits.

The new g_{ik}'s greatly increased the R^2 for both equations with only the health status scores—to 40.7 percent and 37.6 percent. Most striking of the changes in the coefficients are for dimensions 2, 4, and 6. Dimension 4 now has a nearly no service use. Apparently, the introduction of the service measures in the definition of the groups redefined dimension 4 as a demented and neurologically impaired dimension with few acute medical problems. The low service use of this dimension seems consistent with the intent of the home health benefit, because these persons would have little likelihood of improving their cognitive status; and there were few coexistent physical problems that could be benefited by home health service. The increase in reimbursement for dimensons 6 and 2 reflect the effect of introducing the interaction of service use with health status. Thus, there are factors (e.g., early mortality for highly morbid persons, high potential for rehabilitation) affecting these two dimensions that drive up costs that are not reflected in the original 56 health and functional status measures.

The introduction of covariates into the cost equations shows effects similar in sign but generally larger than in Table 6. For example, SNF use for dimension 4 reduces the home health reimbursement 86.3 percent, and hospital bills increase home health reimbursement 10 percent per $1,000 of hospital costs. The effect of unmet needs increases as does the effect of being black. The sign of the sex coefficient reversed.

The coefficients for the total number of visits equation are generally consistent with the pattern of increases and decreases for the cost equation.

At the bottom of the table, we see that the range of reimbursements predicted by the equations is much greater (i.e., 153.20 to 7986.70) reflecting the higher predictability of costs.

Results: Episodes

In Table 8, we present an analysis of constructed episodes orginating in a 12-month interval centered on the midpoint of the survey.

The R^2's (30.4 and 30.7) for episodes using the g_{ik}'s from the 58 variable GOM analyses are not as high as for the capitation model. In this case, however, the covariates increase R^2's to 43.2 and 42.3 percent—values as high as for the capitation results.

The prices for the case-mix dimensions are similar to those in Table 7 except for dimensions 5 and 6. Dimension 5 shows a large increase in reimbursement (to $1,738). Dimension 6 experienced a decrease to $6,841 in the episode model. The effects of SNF use for the episode model are much greater than for capitation, and the effects of hospital reimbursements are smaller.

Table 7

Expected home health agency reimbursement costs and percent of home health agency visits, with and without covariates, by selected variables

Variable	HHA[1] reimbursements: Without covariates	HHA[1] reimbursements: With covariates	HHA[1] visits: Without covariates	HHA[1] visits: With covariates
R^2	40.7	44.8	37.6	41.7
Case-mix dimensions (g_{ik}'s)				
Type 1, Acute problem	$954	$750	24.3	27.1
	(6.86)	(6.62)	(3.19)	(3.30)
Type 2, Hip and other fracture	1,940	1,108	61.6	49.9
	(7.57)	(7.01)	(4.12)	(3.91)
Type 3, Cancer	1,557	1,541	42.5	60.3
	(7.35)	(7.34)	(3.75)	(4.10)
Type 4, Chronic medical problem	41	37	1.0	1.5
	(3.71)	(3.66)	(0.07)	(0.42)
Type 5, Acute medical problem	1,301	880	42.1	36.3
	(7.17)	(6.78)	(3.74)	(3.59)
Type 6, Multiple problems and neurological impairment	8,783	6,905	221.5	257.2
	(9.08)	(8.84)	(5.40)	(5.55)
Set 1, Incomplete survey	1,013	934	28.2	37.3
	(6.92)	(6.84)	(3.34)	(3.62)
Set 2, Not chronically disabled	700	578	19.3	22.4
	(6.55)	(6.36)	(2.96)	(3.11)
Service use (percent change in price)				
SNF[2] bills	—	−3.4	—	−7.3
SNF[2] bills × Type 5	—	6.3	—	28.0
SNF[2] bills × Type 4	—	−86.3	—	−90.8
Hospital costs (per $1,000)	—	10.0	—	1.1
Hospital costs × pure Type 2 (per $1,000)	—	5.9	—	4.4
Hospital costs × Set 2 (per $1,000)	—	0.8	—	1.0
Number of informal caregiver days	—	−1.3	—	−1.4
Out-of-pocket payment for long-term care (per $1,000 per year)	—	−1.8	—	−1.7
Unmet activity of daily living	—	−36.3	—	−33.2
Unmet instrumental activity of daily living	—	18.3	—	21.0
Sociodemographic				
Age	—	0.5	—	0.5
Marital status	—	4.2	—	4.2
Male	—	−9.7	—	−9.5
Income per $1,000	—	−0.1	—	−0.8
Black	—	27.3	—	20.9
State of residence controls	—	(3)	—	(3)
$\bar{x}$	1,135.6	1,132.2	31.5	31.8
Range:				
Predicted	153.2 to 7,986.7	90.5 to 11,124.2	4.1 to 200.9	2.2 to 293.2
Observed	28.5 to 18,327.6	27.5 to 18,327.6	1.0 to 356.0	1.0 to 356.0

[1]Home health agency.
[2]Skilled nursing facility.
[3]Numbers and coefficients not presented.

NOTE: Figures in parentheses are log values.

SOURCES: Health Care Financing Administration and Office of the Assistant Secretary for Planning and Evaluation, Department of Health and Human Services: Data from the 1982 National Long-Term Care Survey; Health Care Financing Administration, Bureau of Data Management and Strategy: Data from the Medicare Statistical System.

Discussion

We have demonstrated that a multivariate classification strategy could be used to generate a case-mix index for Medicare home health benefits based on dimensions that were clinically distinct, that had significant differences in reimbursement that were consistent with the clinical nature of the dimensions, and that predicted both individual costs and visits over a long period of time very well.

In producing case-mix measures for different definitions of episodes and fixed intervals, insights were developed into the use of the home health benefit—and the implications of that use for case-mix strategies. First, the capitation and episode models predicted service use at the individual level equally well. The health composite variable was more strongly predictive in the capitation model, and the interaction of prior acute care service use with the health composite variable was more important for the

Table 8

Expected home health agency reimbursement costs and percent of home health agency visits, with and without covariates, by selected variables

Variable	HHA[1] reimbursements		HHA[1] visits	
	Without covariates	With covariates	Without covariates	With covariates
R^2	30.4	43.2	30.7	42.3
Case-mix dimensions				
Type 1, Acute problem	$926	$624	24.5	14.2
	(6.30)	(6.03)	(2.67)	(2.65)
Type 2, Hip and other fracture	2,102	859	63.5	35.4
	(7.12)	(6.35)	(3.62)	(3.16)
Type 3, Cancer	1,809	1,459	49.5	51.2
	(6.97)	(6.88)	(3.35)	(3.53)
Type 4, Chronic medical problem	42	47	1.1	1.7
	(3.20)	(3.45)	(−0.43)	(0.13)
Type 5, Acute medical problem	1,738	978	51.9	34.7
	(6.93)	(6.48)	(3.42)	(3.14)
Type 6, Multiple problems and neurological impairment	5,841	4,087	176.0	140.5
	(8.30)	(7.91)	(4.64)	(4.54)
Set 1, Incomplete survey	935	739	25.3	26.5
	(6.31)	(6.20)	(2.70)	(3.28)
Set 2, Not chronically disabled	821	516	22.2	18.1
	(6.71)	(5.84)	(2.57)	(2.90)
Service use (percent change in price)				
SNF[2] bills	—	17.7	—	−17.5
SNF[2] bills × Type 5	—	−364.1	—	−345.0
SNF[2] bills × Type 4	—	−126.6	—	−143.0
Hospital costs (per $1,000)	—	1.7	—	1.8
Hospital costs × pure Type 2 (per $1,000)	—	7.4	—	6.0
Hospital costs × Set 2 (per $1,000)	—	1.3	—	1.1
Number of informal caregiver days	—	−1.6	—	−1.5
Out-of-pocket payment for long-term care (per $1,000 per year)	—	−1.7	—	−1.9
Unmet activity of daily living	—	−26.6	—	−23.0
Unmet instrumental activity of daily living	—	54.2	—	56.2
Sociodemographic				
Age	—	0.9	—	0.8
Marital status	—	6.8	—	6.7
Male	—	−3.7	—	−3.7
Income per $1,000	—	−0.01	—	−0.1
Black	—	49.5	—	41.5
State of residence controls	—	[3]	—	[3]
$\bar{x}$	1,204.7	1,202.0	32.8	33.0
Range:				
Predicted	166.5 to 5,376.6	103.8 to 7,431.6	4.5 to 138.2	2.3 to 211.4
Observed	30.4 to 11,899.3	27.5 to 11,899.3	1.0 to 342.0	1.0 to 342.0

[1] Home health agency.
[2] Skilled nursing facility.
[3] Numbers and coefficients not presented.

NOTE: Figures in parentheses are log values.

SOURCES: Health Care Financing Administration and Office of the Assistant Secretary for Planning and Evaluation, Department of Health and Human Services: Data from the 1982 National Long-Term Care Survey; Health Care Financing Administration, Bureau of Data Management and Strategy: Data from the Medicare Statistical System.

episode definition. This seems reasonable given that the episode accumulation of home health reimbursement is driven by the medical acuity of the health problems involved. The capitation model seemed to be less time dependent and to function more like a purely long-term care benefit. This would seem to suggest the superiority of the capitation based case-mix measures. Second, the introduction of reimbursement and visits into the GOM analyses to produce augmented health composite measures produced two important insights. One insight was that, by employing service use measures in the definition of case mix in a similar fashion to the construction of discrete case-mix categories on charges or length of stay, the R^2 of the individual prediction was greatly increased. Additionally, the health content of the composite measures was altered by the introduction of the cost measures (and in ways that seemed clinically reasonable). These insights are useful in guiding subsequent research. Finally, we saw that

the other service use measures included in the regressions had significant impact. Consequently, the use of the case-mix index has to take into account the informal care resources of the individual; the substitutability of institutional, hospital, and home health care; and the individual's own resources and payments out of pocket for formal care.

The analysis illustrated both the potential for developing a home health case-mix measure and the feasibility of developing case-mix measures for other types of community based LTC services. These analyses should be viewed, however, as demonstrating feasibility rather than as defining the precise reimbursement mechanisms because the analyses lacked precise cost and service data and we did not possess data identified by provider to determine the aggregate cost implications of different reimbursement strategies across home health agencies. Nonetheless, the results demonstrate the potential for prospectively reimbursing home health services to create incentive to care for frailer subpopulations but yet to preserve the overall budget neutrality of the benefit.

Summary

In the foregoing analyses, we used data from the 1982 NLTCS linked to reimbursement records for Medicare Part A and B to generate case-mix measures for home health service reimbursement. In the NLTCS, 6,393 people were identified as chronically disabled (>90 days impairment in an ADL or IADL) from 36,000 persons drawn from the health insurance master file. For these 6,393 persons, two types of rules were calculated for describing use of home health benefits. The first defined episodes of care for continuous periods of service use beginning within 6 months of the survey date—1,316 persons of the 36,000 had home health service use, with 712 of these disabled persons. The second defined a fixed interval or capitation period. In this case, we examined any bill that had a beginning date in 1982—1,286 of the 36,000 had some health bills in 1982, with 691 of these persons chronically disabled.

To generate a case-mix measure, a multivariate procedure was applied to health and functional status measures recorded in the survey. Included among these were 29 diagnostic indicators and 27 ADL, IADL, and IADL2 measures. The procedure identified the following six clinically meaningful dimensions:

- A relatively functionally intact dimension with limited medical problems.
- A dimension characterized by musculoskeletal problems with serious mobility limitations.
- A dimension with cancer and other acute medical problems.
- A dimension with multiple chronic health problems.
- A dimension with acute and chronic circulatory and respiratory problems.
- A neurologically impaired dimension with a wide range of functional problems.

Table 9

Percent of variance explained for different home health service regression models with different periods of service definitions, health measures, and levels of control for other covariates

Source	Variables used in constructing case-mix dimensions	Period type	Case-mix dimensions only	Case-mix dimensions and other covariates
			Percent of variance	
Table 6	Health, functional (56)	Capitation	16.8	25.3
Table 7	Health, functional, services (58)	Capitation	40.7	44.8
Table 8	Health, functional, services (58)	Episode	30.4	43.2

Individual scores on each of these dimensions were regressed on the logarithm of both home health total reimbursements and number of visits. The level of prediction using these health and functional status measures is provided in Table 9 along with the level of prediction achieved when additional service-use measures are included.

Up to 45 percent of the individual variation of home health reimbursements could be explained. This level of predictability can be compared with the level of prediction achieved by the DRG case-mix system for individual costs for Medicare hospital charges. For all DRG's in four States with available data in 1982 (i.e., Michigan, New Jersey, North Carolina, Washington), the level of predictability was from 17 to 30 percent, with three States being between 16 and 18 percent. Perhaps more importantly, the overall level of DRG prediction was higher because of high R^2's for surgical DRG's. The R^2's for medical and psychiatric DRG's, which would seem to be more comparable to predicting home health use, were much lower, i.e., from 6 to 9 percent for medical DRG's and from 5 to 10 percent for psychiatric DRG's (Morrison et al., 1985). Thus, though we did not use identically the same regression methodology for evaluating the level of fit as in those studies, it appears that the level of prediction achieved by the GOM groups in predicting individual costs is higher than that achieved for the DRG groups—especially for individual medical and psychiatric hospital costs. Because we did not have home health agency specific costs, we cannot compare the ability of the GOM groups to predict aggregate agency costs with the DRG ability to predict hospital level costs that had been cited as about 35 percent using case-mix index only and about 72 percent using case-mix and nonmedical variables (Pettingill and Vertrees, 1982).

The research reported in this article had two purposes: to assess the feasibility of developing case-mix indexes for home health service and to analyze

the factors contributing to the use of the services. The results of the study suggest strongly that it is feasible to develop such case-mix indexes; but that, not surprisingly, they will be differently structured than case-mix indexes for acute care. Central to the differences between the two types of measures are the needs in the home health indexes to reflect the likely chronicity of service use, the effect of service substitution on the period of home health service use, and the impact of individual economic and family resources on home health use.

Naturally, before actually implementing a specific case-mix index, a significant amount of validating work and research is required. For example, one would need to apply any derived case-mix measure to more extensive sets of data to see how well the structure of the case-mix groups replicates. One should also evaluate the performance of the GOM methodology (and the blended rate pricing methodology) against other grouping procedures (e.g., Autogroup—the classification program used in the creation of the DRG categories). Finally, one should compare the performance and structure of the GOM dimensions with those derived for reimbursements in nursing homes (e.g., RUG's or resource utilization groups) and with those developed for acute care reimbursement (i.e., DRG's and some proposed modifications). Such a comparison could help us understand differences in market mechanisms and patient needs in each service area. This could help us to determine how the different case-mix systems might need to be coordinated and to better understand the impact on levels of services delivered under those systems. We are currently involved in the extension of these evaluations to the 1984 replication of the national LTC survey and to comparisons with other grouping methodologies.

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Does the Average Cost of Home Health Care Vary with Case Mix?

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Synopsis

The relationship between the average cost of home health care and the case mix of patients served by the home health agency is investigated using 1983 data from Wisconsin's home health care agencies. In contrast to previous work, case mix is shown to have a significant effect on the home health agency's average costs. The methods used in the previous work are evaluated, and differences between the earlier study and the present study are discussed to explain the divergent results. Also, average costs are shown to decrease with output, to increase with the proportion of private patients served by the agency, and to be higher if the home health agency is located in an urban area or if it has a proprietary charter.

The implications of this research for the design of an appropriate home health reimbursement policy are discussed. Primarily, it is argued that, although future research might confirm the relationship between average costs and case mix for home health agencies, we cannot necessarily conclude that reimbursement rates must be adjusted to account for differences in case mix as many States are now doing for nursing home reimbursement. Policies must take into account the fundamental differences between home health agencies and nursing homes, and their respective markets, in order to be effective.

ALTHOUGH A LARGE NUMBER of articles have investigated the determinants of average costs of nursing homes, the health services literature has almost totally neglected similar "cost function" research with regard to home health agencies. This neglect is somewhat surprising since many of the

issues motivating such research in nursing homes apply to home health agencies as well. For example, the degree to which both nursing homes and home health agencies experience cost decreases as their output increases (that is, the degree to which they experience economies of scale) is important in determining the ability of competing firms to enter markets on the same cost footing as existing firms. Economies of scale also have implications for reimbursement policy: if average costs decrease as more output is produced, relatively low prospective reimbursement payments might favor large operations, driving smaller volume firms out of the markets.

Another area of interest is the relationship between average costs and the charter status of the firm. In the nursing home literature, proprietary homes have often been accused of scrimping on services in order to reduce costs and increase profits. The same might be expected of proprietary home health agencies.

Still another issue shared by these two types of health care firms is whether prospective reimbursement payments to home health agencies for Medicare and Medicaid patients should be adjusted for case mix. Because a number of States have adopted or are considering the adoption of prospective case-adjusted Medicaid reimbursement payments for nursing home care, interest is growing in case-adjusted reimbursement of home health care. However, in contrast to the nursing home cost function studies—many of which have shown evidence of a direct relationship between average nursing home costs and the dependency of the patient case mix—the sole existing study to estimate the relationship between home health agency costs per visit and case mix concluded that there was little evidence to suggest that costs were directly related to the degree of dependency of the patient (*1*). (Four other studies (*2–5*) have investigated this relationship, but none of these has used the firm as the unit of observation to estimate a "cost function" relationship as is conventionally found in the nursing home literature.) This counterintuitive finding would suggest that there is little need for proposals (*6*) to pay home health agencies higher reimbursements when they care for more dependent clients.

In a larger sense, the current interest in home health agencies as a potentially less costly or more beneficial alternative to nursing home care dictates that we learn as much as possible about these firms before policies are enacted. Nursing home policy has been accused of being made without a complete or accurate picture of how nursing homes behave when faced with various public policies. Policymakers have mistakenly assumed that nursing homes were simply miniature hospitals and that the same sorts of policies were applicable, often with unintended results (*7*). Similarly, it would be a mistake to assume that it is appropriate to apply nursing home policies to home health agencies, unless it is known that such policies fit the specific characteristics of these firms and their markets. Therefore, basic research into the general behavior of these firms is crucial.

The remainder of this paper is organized into three sections. In the first section, a model of the home health agency cost function is developed based on standard economic determinants of a firm's average costs. In the second section, this function is estimated using 1983 Wisconsin data and the results are reported. And in the final section, the policy implications are discussed.

Model

Regression analysis was used to identify the significant determinants of average home health agency costs. Average costs, the dependent variable, was represented by the cost per home health care visit. This variable was constructed by dividing each home health agency's total 1983 expenditures—both payroll and nonpayroll (Wisconsin's distinction)—by the total number of visits during 1983. Because some agencies kept hourly data on the amount of homemaker services delivered, this information was converted to the number of visits by arbitrarily assuming that 1 hour of homemaker services equalled one visit. This specification of the dependent variable seemed the most appropriate for our purposes since it is consistent with the unit of service by which home health agencies are currently being paid. That is, both private and public patients pay on a per visit basis, rather than per case. Furthermore, existing prospective case-adjusted reimbursement systems for nursing home pay on a per diem, rather than per case, basis. If the case-adjusted reimbursement systems for nursing homes serve as a model, prospective home health reimbursement rates are also likely to be set on a per visit basis. Therefore, the dependent variable was specified as average costs per visit.

The choice of independent variables to include in the regression was dictated by the issues to be investigated. The first of these issues is whether economies of scale are present for home health agencies. To test whether economies of scale exist,

the number of visits and the number of visits squared were included in the regression. If economies are present, average costs of production should decrease as more visits are made. The squared visits term was included to test for an upward sloping section of the average cost curve. A positive coefficient would indicate that, beyond some point, average costs increase with the number of vists; that is, diseconomies of scale occur. Together, both variables permit the calculation of the minimum point on this cost function, if evidence suggests that one exists.

In the sole existing study to investigate the relationship between agency costs and case mix, Hay and Mandes (*1*) concluded that there was little evidence that such a relationship exists. To try to replicate these counterintuitive results, a case-mix variable was included in the regression.

Case mix was represented by a variable constructed from activities of daily living (ADL) scores for patients served by the agency on a certain date. Specifically, the number of ADLs (bathing, continence of bowels, continence of bladder, mobility, dressing, feeding, toileting, transferring from bed to chair) with which patients needed help was assumed for all patients served by the agency on a certain day. This number was then divided by the number of patients served on that day to derive a variable that represented the average ADL score of the agency's clientele. ADL scores were used instead of other measures (such as instrumental activities of daily living scores) because ADLs seem to be a more widely accepted measures of case mix. For example, they are the basis for patient classification under New York's experimental reimbursement system for nursing homes—resource utilization groups. ADLs also seem more consistent with the skilled nursing case-mix concept that Hay and Mandes' attempt to capture since they are more related to the relative medical dependencies of patients. It was hypothesized that higher ADL scores would be associated with higher average costs.

Home health agencies provide a number of different services. Because the costs of producing these various services may differ, it is necessary to control for different outputs in some way. One way is simply to focus on one type of output. For example, the average cost of skilled nursing care might be regressed on the number of skilled nursing visits and visits squared, the case mix of the skilled nursing patients, and so forth. One problem with this approach is that it does not allow for the possibility that, if the volume of visits is sufficiently large, workers can specialize in delivering one or two types of services. Simply regressing the average costs of skilled care on the number of skilled nursing visits may not capture the effect that more visits of all types might have on the costs of a skilled nursing visit through specialization. Similarly, this approach also does not capture how fixed costs are spread over all types of visits. Both the specialization of labor and spreading of fixed costs are important in determining whether prospective reimbursement payments should be set lower for larger agencies.

An alternative approach to controlling for the type of output is to include variables that represent the percentage of visits devoted to providing different services in the regression equation. Following this approach, the percentage of the agency's visits that were devoted to homemaker services and the percentage devoted to skilled nursing care were included in the regression as separate variables. Although these were only two of seven categories of therapeutic care for which Wisconsin collected information (the other five categories were physical therapy, speech pathology, occupational therapy, medical social service, and other service), they accounted for 88 percent of all visits (*8*). The other categories of services accounted for uniformly small proportions of visits, and were added together and viewed as a residual percentage for that reason. With this approach, the regression statistics will reflect a more accurate picture of the relationship between average costs and output, and therefore a more accurate picture of whether economies of scale exist.

Average costs also depend on the prices of the inputs used. It is assumed that prices of inputs are higher in large metropolitan areas. Consequently, a dummy variable was constructed representing whether the agency served one of the five most populous counties in the State, namely, Milwaukee, Dane, Waukesha, Brown, and Racine Counties. These counties represent the Milwaukee, Madison, and Green Bay urban areas. Costs are expected to increase with this variable.

Finally, two variables were included because the average amounts reimbursed for patients in these categories were so great. The total bill for each patient served during the 1983 fiscal year averaged $794 (*8*). If the patient was paid for by Medicare, the average total bill was $753; by Medicaid, $831; and by private sources, $1,062. When broken down by agency ownership, government agencies averaged $512 per patient in revenues; nonprofit agencies, $674; and proprietary agencies, $2,095. Con-

Table 1. Costs and patient statistics for 83 home health agencies, Wisconsin 1983

Variable	Mean	Standard deviation
Average costs	$35.086	16.683
Total visits	7890.800	13568.406
Average ADL score	2.303	0.965
Home health aide visits (as percent of all visits)	44.050	19.659
Skilled nursing visits (as percent of all visits)	45.934	20.098
Urban	0.188	0.393
Proprietary	0.213	0.412
Private pay patients (as percent of all patients)	19.404	21.039

Table 2. Results of regression with average costs (total costs per visit) as dependent variable for 83 home health agencies, Wisconsin 1983 [1]

Independent variable	Coefficient	Standard error	Significance level
Intercept	17.218	14.532	.2399
Total visits	−0.0013	0.0006	.0390
Total visits squared	5.12E−09	6.90E−09	.4605
Average ADL score	5.733	2.839	.0471
Percent home health aide visits	−19.961	17.684	.2626
Percent skilled nursing visits	30.331	18.409	.1037
Urban	17.818	7.293	.0169
Proprietary	15.437	8.351	.0685
Percent private pay patients	29.139	14.341	.0458

[1] R^2 = .38, F value = 5.797.

sidering only private source revenues, government agencies received $317 per patient; nonprofits, $546; and proprietaries averaged $3,531.

In view of these great differences in revenues for patients served by proprietary firms and for patients paying from private sources, it would be interesting to see whether higher costs could be attributed to firms with these characteristics. Accordingly, two variables, one representing whether the firm is proprietary and the other measuring the percentage of private patients served during the 1983 fiscal year, were included in the regression. Positive signs here would indicate that these higher revenues were to some extent explained by higher average costs.

Results

The data for this study come from Wisconsin's first Annual Survey of Home Health Agencies. This survey, like a similar one for nursing homes, must be completed by all agencies as part of the annual requirements for licensure in Wisconsin. Although 121 agencies provided sufficient information to be included in the data file, missing data constrained the sample to 83 agencies.

Three different periods are represented in the data. Some variables, such as the total number of visits, were collected for calendar year 1983. Financial data, such as total revenues and total expenses, were collected for the firms' 1983 fiscal year, and data on client characteristics, such as activities of daily living, were collected for patients served on May 1, 1984. Relating the characteristics of patients served on a certain day to firm characteristics collected over an entire year is a common problem in health research. One test of its acceptability will be the degree to which the regression results reflect expectations.

Descriptive statistics are reported in table 1 and the results for the following regression equation appear in table 2:

$$\begin{aligned} \textit{average costs} = {} & \alpha + \beta_1 \textit{ visits} + \beta_2 \textit{ (total visits)}^2 \\ & + \beta_3 \textit{ average ADL score} \\ & + \beta_4 \textit{ percent home health aide visits} \\ & + \beta_5 \textit{ percent skilled nursing visits} \\ & + \beta_6 \textit{ urban dummy} + \beta_7 \textit{ proprietary dummy} \\ & + \beta_8 \textit{ percent private patients} + \textit{error}. \end{aligned}$$

Both total visits and visits squared have coefficients with signs indicating the conventional u-shape, although only the negative sign on visits is significant. If we take these numbers literally, the average cost function would reach a minimum at about 126,000 visits. This is much greater than the 7,000 skilled visits reported by Jay and Mandes (*1*). The strength of the negative portion and the statistical weakness of the positive portion, however, suggest that there is no significantly increasing portion of the average cost function. In other words, there may be no diseconomies of scale and no optimal number of visits.

Average costs increase as the average ADL score increases showing greater costs for those agencies serving a more dependent mix of patients. The coefficient is significant at the 5 percent level. This is rather strong evidence that a relationship between average costs and case mix exists, especially considering that some error must have been introduced by the fact that the total expenditure data were collected for fiscal year 1983, total visits were

collected for calendar year 1983, and the ADL score for those people served on May 1, 1984.

The percentage of visits categorized as home health aide visits was negatively, but not significantly, related to costs. The percentage of visits classified as skilled nursing was positively, but again not significantly, associated with costs. These results occurred despite the absence of any evidence that multicollinearity had affected the estimates.

As expected, agencies located in high-wage urban areas also experienced significantly higher average costs. The final two variables had positive, significant coefficients revealing that proprietary agencies and agencies serving a large percentage of private patients did have significantly greater costs.

Conclusions

The evidence suggests that diseconomies of scale may not be associated with this industry. This is inconsistent with Hay and Mandes' (*1*) finding of substantial diseconomies of scale, but consistent with Kass' (*9*) finding that the cost function is virtually flat for firms producing near the mean. On the other hand, it seems likely from all the evidence that there is some initial range of output where average costs are decreasing. Both these effects taken together suggest that, if payments for publicly supported users of home health services are the same for all firms, profits are likely to be greater for larger agencies than smaller ones.

The significance of the proprietary and percent private pay patients variables in the equation helps to explain why patients served by proprietary homes and private patients pay so much for care. This, of course, does not rule out other explanations.

This paper presents evidence that a home health agency's case mix, measured by the number of dependencies per patient, is related to average costs. As mentioned, this finding is contrary to the conclusions of Hay and Mandes (*1*), the only other cost function study to address the question of whether agency costs vary with case mix. Differences in the methods of the two studies, however, may account for the different results.

Hay and Mandes (*1*) postulate a total cost function where the dependent variable is the total skilled nursing costs for an agency during a year. They regress this variable on output (measured by the number of skilled nursing visits in that year) and output squared to determine the shape of the firm's average cost curve. To test whether costs vary with the case mix, they include variables

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representing the shares of all costs that are devoted to various cost categories. They hypothesize that agencies serving more severely incapacitated patients will have a larger percentage of expenses devoted to indirect inputs (administration, clerical staff, office space, transportation, and office expenses) than to direct inputs (nursing inputs and medical supplies). Therefore, if the total costs increase with the percentage of costs devoted to indirect input categories and decrease with the percentage of costs in direct input categories, these relationships would indicate that costs are increasing with the severity of the agency's case mix.

Hay and Mandes base their conclusion that case mix probably is not related to costs on two results: the general insignificance of the cost share variables and the high R^2. Both pieces of evidence may, however, be influenced by the specification of their model.

Regarding the insignificance of the cost share variables, the assumed relationship between severity of case mix and the share of costs devoted to *indirect* costs is not intuitively obvious. Severity of case mix could reasonably be associated with a larger share of *direct* nursing and medical supply costs instead. For example, it seems just as likely that severely incapacitated patients would be long-term patients; therefore, the initial administrative and processing portion of their costs would be relatively small compared with the direct care portion.

Furthermore, even if it were true that the percentage of indirect costs was a good proxy for the case mix of the agency's clientele as hypothesized, their specification of this case-mix proxy variable might account for the lack of significance. The authors include five variables to represent the relative amount of indirect costs in their regression equation. Indeed, since indirect cost is a dichotomous variable, the sole direct cost variable—the

share of costs going toward medical supplies—also measures (negatively) indirect costs. As a result, the authors are measuring the same underlying theoretical construct with six variables. If these are all related to case mix (as is their contention), they are all theoretically correlated with each other, and multicollinearity may have been introduced into the equation. If the degree of multicollinearity is sufficiently large, it may render otherwise significant coefficients insignificant. If the case-mix variable is intended to be whether the home health agency's costs are indirect or not, then the most appropriate specification would be to include only one case-mix variable: the portion of all costs in the agency that are indirect.

Regarding the high R^2, Hay and Mandes argue that an R^2 of 96 percent implies that patient case-mix characteristics can at most account for only 4 percent of agency cost variation. Clearly, this conclusion does not permit the possibility that case mix is correlated with one of the included independent variables and is indirectly accounting for a portion of the explained variation. Moreover, their R^2 may also have been influenced by the total cost specification of their regression equation. That is, total costs must increase with output since an additional unit of output requires more resources, and these resources are not free. On the other hand, it is not clear whether average cost will increase or decrease with output. On the basis of specification alone, one might expect that a total cost function might have a higher R^2 than an average cost function. Therefore, their conclusion that at most only 4 percent of cost variation could be attributable to any omitted case-mix variables may be sensitive to their choice of dimension for the cost variable.

In addition, there are other studies that do not employ a cost function analysis, but nevertheless present evidence suggesting that costs increase with the dependency of the patient. For example, Manton and Hausner (*5*) show that patient dependency indices can be constructed that are significantly related to the reimbursement payments to home health agencies. Since these reimbursements reflect costs to some degree, we can reasonably conclude that this study also indicates that a firm's expenditures increase with case mix as measured by these indices.

If future research shows more conclusively that home health agency costs do increase with the dependency of the patient, this finding would suggest that a prospective payment system based on the case mix would be "fairer" and perhaps a more efficient use of government funds than a flat rate per visit. It does not, however, necessarily indicate that a case-mix reimbursement system is required to counter possible "cream skimming" on the part of home health agencies, such as occurs in the nursing home care markets. It is important to remember that, while care given by home health agencies may be regarded by some as a substitute for nursing home care, there are many differences between these two institutions and the markets in which they exist. Therefore, although nursing homes may choose among prospective patients on the basis of patient characteristics, it is not necessarily true that home health agencies will do the same.

The crucial difference is that many nursing homes face an excess demand for their care. This means that the number of patients they can serve is constrained by the number of beds they have in the short run, and certificate of need laws or construction moratoria in the long run. If there are more patients than beds available, prospectively paid homes with profit-maximizing objectives would naturally opt to serve patients with lower costs. Heavy-care patients would be excluded, even though the prevailing reimbursement rate is sufficient to cover the costs of their care, because nursing homes can make more money caring for the lighter-care patients (*10, 11*). With home health care, excess demand is less of an issue. If the demand becomes great enough, more care-giving personnel can be hired. Therefore, rather than turn down a customer, home health agencies will serve anyone that requests home health services, regardless of the severity of their incapacity, as long as revenues cover marginal costs. Consequently, cream skimming is not a reason to adopt case-mix reimbursement of home health agencies.

Research into the behavior of home health agencies is in its infancy. Most of the problems with research efforts to date (including those of this paper) can be traced to a lack of good measures for theoretically important variables. If the appropriate measures are not available, then researchers have been forced to use either distant proxies or omit the variable altogether. Clearly, all existing efforts would have benefited from having a more reliable and more comprehensive data set available. Given this lack of data, we can only hope for relatively crude approximations of the real underlying behavior. When these pioneering studies occasionally produce counterintuitive results, they force us to question our assumptions about reality and make further inquiries into the issue. To their

credit, they force us to root our knowledge and policy prescriptions in scientifically supportable evidence. As a result, we are less likely to make major policy errors, and the policies we do make are more likely to be effective.

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Runners' Health Habits, 1985–"The Alameda 7" Revisited

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Synopsis

Seven health habits were shown to be associated with longevity in a longitudinal study initiated in Alameda County, CA, in 1965. These habits (drinking moderately, exercising regularly, maintaining desirable weight for height, eating breakfast, not eating snacks, sleeping 7 or 8 hours per day, and never having smoked) were recently examined in a sample of the U.S. population. Subgroups with low income and little education were found to have low frequency of these health habits. In this report, findings on the frequency of these habits in 966 habitual runners in South Carolina are presented separately for men and women and according to age, education, income, and weekly mileage.

Subgroups of the runners are surprisingly similar to subgroups of the national sample for several health habits. In addition, among the runners, low-income groups and those with little education have a lower frequency of good health habits relative to the other groups, although these differences are not statistically significant. Overall, about half of the runners practice five or more good health habits. These results indicate that even among healthy runners there is need for improvement in the adoption of health habits thought to be associated with reduced morbidity and mortality.

IN A 9-YEAR FOLLOWUP to a longitudinal study initiated in 1965 in Alameda County, CA, seven health habits were identified that were associated with physical health status and low mortality (*1,2*). These habits were drinking moderately or not at all, exercising regularly, maintaining desirable weight for height, eating breakfast, not eating snacks, sleeping 7 or 8 hours per day, and never having smoked cigarettes. Researchers in several studies have attempted to describe the frequency of these habits in other populations and to relate these habits to health status. In a recent report on the frequency of the health habits in a sample of United States adults, important differences were

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Does the Average Cost of Home Health Care Vary with Case Mix?

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Synopsis

The relationship between the average cost of home health care and the case mix of patients served by the home health agency is investigated using 1983 data from Wisconsin's home health care agencies. In contrast to previous work, case mix is shown to have a significant effect on the home health agency's average costs. The methods used in the previous work are evaluated, and differences between the earlier study and the present study are discussed to explain the divergent results. Also, average costs are shown to decrease with output, to increase with the proportion of private patients served by the agency, and to be higher if the home health agency is located in an urban area or if it has a proprietary charter.

The implications of this research for the design of an appropriate home health reimbursement policy are discussed. Primarily, it is argued that, although future research might confirm the relationship between average costs and case mix for home health agencies, we cannot necessarily conclude that reimbursement rates must be adjusted to account for differences in case mix as many States are now doing for nursing home reimbursement. Policies must take into account the fundamental differences between home health agencies and nursing homes, and their respective markets, in order to be effective.

Although a large number of articles have investigated the determinants of average costs of nursing homes, the health services literature has almost totally neglected similar "cost function" research with regard to home health agencies. This neglect is somewhat surprising since many of the

issues motivating such research in nursing homes apply to home health agencies as well. For example, the degree to which both nursing homes and home health agencies experience cost decreases as their output increases (that is, the degree to which they experience economies of scale) is important in determining the ability of competing firms to enter markets on the same cost footing as existing firms. Economies of scale also have implications for reimbursement policy: if average costs decrease as more output is produced, relatively low prospective reimbursement payments might favor large operations, driving smaller volume firms out of the markets.

Another area of interest is the relationship between average costs and the charter status of the firm. In the nursing home literature, proprietary homes have often been accused of scrimping on services in order to reduce costs and increase profits. The same might be expected of proprietary home health agencies.

Still another issue shared by these two types of health care firms is whether prospective reimbursement payments to home health agencies for Medicare and Medicaid patients should be adjusted for case mix. Because a number of States have adopted or are considering the adoption of prospective case-adjusted Medicaid reimbursement payments for nursing home care, interest is growing in case-adjusted reimbursement of home health care. However, in contrast to the nursing home cost function studies—many of which have shown evidence of a direct relationship between average nursing home costs and the dependency of the patient case mix—the sole existing study to estimate the relationship between home health agency costs per visit and case mix concluded that there was little evidence to suggest that costs were directly related to the degree of dependency of the patient (*1*). (Four other studies (*2-5*) have investigated this relationship, but none of these has used the firm as the unit of observation to estimate a "cost function" relationship as is conventionally found in the nursing home literature.) This counterintuitive finding would suggest that there is little need for proposals (*6*) to pay home health agencies higher reimbursements when they care for more dependent clients.

In a larger sense, the current interest in home health agencies as a potentially less costly or more beneficial alternative to nursing home care dictates that we learn as much as possible about these firms before policies are enacted. Nursing home policy has been accused of being made without a complete or accurate picture of how nursing homes behave when faced with various public policies. Policymakers have mistakenly assumed that nursing homes were simply miniature hospitals and that the same sorts of policies were applicable, often with unintended results (*7*). Similarly, it would be a mistake to assume that it is appropriate to apply nursing home policies to home health agencies, unless it is known that such policies fit the specific characteristics of these firms and their markets. Therefore, basic research into the general behavior of these firms is crucial.

The remainder of this paper is organized into three sections. In the first section, a model of the home health agency cost function is developed based on standard economic determinants of a firm's average costs. In the second section, this function is estimated using 1983 Wisconsin data and the results are reported. And in the final section, the policy implications are discussed.

Model

Regression analysis was used to identify the significant determinants of average home health agency costs. Average costs, the dependent variable, was represented by the cost per home health care visit. This variable was constructed by dividing each home health agency's total 1983 expenditures—both payroll and nonpayroll (Wisconsin's distinction)—by the total number of visits during 1983. Because some agencies kept hourly data on the amount of homemaker services delivered, this information was converted to the number of visits by arbitrarily assuming that 1 hour of homemaker services equalled one visit. This specification of the dependent variable seemed the most appropriate for our purposes since it is consistent with the unit of service by which home health agencies are currently being paid. That is, both private and public patients pay on a per visit basis, rather than per case. Furthermore, existing prospective case-adjusted reimbursement systems for nursing home pay on a per diem, rather than per case, basis. If the case-adjusted reimbursement systems for nursing homes serve as a model, prospective home health reimbursement rates are also likely to be set on a per visit basis. Therefore, the dependent variable was specified as average costs per visit.

The choice of independent variables to include in the regression was dictated by the issues to be investigated. The first of these issues is whether economies of scale are present for home health agencies. To test whether economies of scale exist,

the number of visits and the number of visits squared were included in the regression. If economies are present, average costs of production should decrease as more visits are made. The squared visits term was included to test for an upward sloping section of the average cost curve. A positive coefficient would indicate that, beyond some point, average costs increase with the number of visits; that is, diseconomies of scale occur. Together, both variables permit the calculation of the minimum point on this cost function, if evidence suggests that one exists.

In the sole existing study to investigate the relationship between agency costs and case mix, Hay and Mandes (*1*) concluded that there was little evidence that such a relationship exists. To try to replicate these counterintuitive results, a case-mix variable was included in the regression.

Case mix was represented by a variable constructed from activities of daily living (ADL) scores for patients served by the agency on a certain date. Specifically, the number of ADLs (bathing, continence of bowels, continence of bladder, mobility, dressing, feeding, toileting, transferring from bed to chair) with which patients needed help was assumed for all patients served by the agency on a certain day. This number was then divided by the number of patients served on that day to derive a variable that represented the average ADL score of the agency's clientele. ADL scores were used instead of other measures (such as instrumental activities of daily living scores) because ADLs seem to be a more widely accepted measures of case mix. For example, they are the basis for patient classification under New York's experimental reimbursement system for nursing homes—resource utilization groups. ADLs also seem more consistent with the skilled nursing case-mix concept that Hay and Mandes' attempt to capture since they are more related to the relative medical dependencies of patients. It was hypothesized that higher ADL scores would be associated with higher average costs.

Home health agencies provide a number of different services. Because the costs of producing these various services may differ, it is necessary to control for different outputs in some way. One way is simply to focus on one type of output. For example, the average cost of skilled nursing care might be regressed on the number of skilled nursing visits and visits squared, the case mix of the skilled nursing patients, and so forth. One problem with this approach is that it does not allow for the possibility that, if the volume of visits is sufficiently large, workers can specialize in delivering one or two types of services. Simply regressing the average costs of skilled care on the number of skilled nursing visits may not capture the effect that more visits of all types might have on the costs of a skilled nursing visit through specialization. Similarly, this approach also does not capture how fixed costs are spread over all types of visits. Both the specialization of labor and spreading of fixed costs are important in determining whether prospective reimbursement payments should be set lower for larger agencies.

An alternative approach to controlling for the type of output is to include variables that represent the percentage of visits devoted to providing different services in the regression equation. Following this approach, the percentage of the agency's visits that were devoted to homemaker services and the percentage devoted to skilled nursing care were included in the regression as separate variables. Although these were only two of seven categories of therapeutic care for which Wisconsin collected information (the other five categories were physical therapy, speech pathology, occupational therapy, medical social service, and other service), they accounted for 88 percent of all visits (*8*). The other categories of services accounted for uniformly small proportions of visits, and were added together and viewed as a residual percentage for that reason. With this approach, the regression statistics will reflect a more accurate picture of the relationship between average costs and output, and therefore a more accurate picture of whether economies of scale exist.

Average costs also depend on the prices of the inputs used. It is assumed that prices of inputs are higher in large metropolitan areas. Consequently, a dummy variable was constructed representing whether the agency served one of the five most populous counties in the State, namely, Milwaukee, Dane, Waukesha, Brown, and Racine Counties. These counties represent the Milwaukee, Madison, and Green Bay urban areas. Costs are expected to increase with this variable.

Finally, two variables were included because the average amounts reimbursed for patients in these categories were so great. The total bill for each patient served during the 1983 fiscal year averaged $794 (*8*). If the patient was paid for by Medicare, the average total bill was $753; by Medicaid, $831; and by private sources, $1,062. When broken down by agency ownership, government agencies averaged $512 per patient in revenues; nonprofit agencies, $674; and proprietary agencies, $2,095. Con-

Table 1. Costs and patient statistics for 83 home health agencies, Wisconsin 1983

Variable	Mean	Standard deviation
Average costs	$35.086	16.683
Total visits	7890.800	13568.406
Average ADL score	2.303	0.965
Home health aide visits (as percent of all visits)	44.050	19.659
Skilled nursing visits (as percent of all visits)	45.934	20.098
Urban	0.188	0.393
Proprietary	0.213	0.412
Private pay patients (as percent of all patients)	19.404	21.039

Table 2. Results of regression with average costs (total costs per visit) as dependent variable for 83 home health agencies, Wisconsin 1983 [1]

Independent variable	Coefficient	Standard error	Significance level
Intercept	17.218	14.532	.2399
Total visits	−0.0013	0.0006	.0390
Total visits squared	5.12E−09	6.90E−09	.4605
Average ADL score	5.733	2.839	.0471
Percent home health aide visits	−19.961	17.684	.2626
Percent skilled nursing visits	30.331	18.409	.1037
Urban	17.818	7.293	.0169
Proprietary	15.437	8.351	.0685
Percent private pay patients	29.139	14.341	.0458

[1] R^2 = .38, F value = 5.797.

sidering only private source revenues, government agencies received $317 per patient; nonprofits, $546; and proprietaries averaged $3,531.

In view of these great differences in revenues for patients served by proprietary firms and for patients paying from private sources, it would be interesting to see whether higher costs could be attributed to firms with these characteristics. Accordingly, two variables, one representing whether the firm is proprietary and the other measuring the percentage of private patients served during the 1983 fiscal year, were included in the regression. Positive signs here would indicate that these higher revenues were to some extent explained by higher average costs.

Results

The data for this study come from Wisconsin's first Annual Survey of Home Health Agencies. This survey, like a similar one for nursing homes, must be completed by all agencies as part of the annual requirements for licensure in Wisconsin. Although 121 agencies provided sufficient information to be included in the data file, missing data constrained the sample to 83 agencies.

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Descriptive statistics are reported in table 1 and the results for the following regression equation appear in table 2:

$$\textit{average costs} = \alpha + \beta_1\,\textit{visits} + \beta_2\,(\textit{total visits})^2 + \beta_3\,\textit{average ADL score} + \beta_4\,\textit{percent home health aide visits} + \beta_5\,\textit{percent skilled nursing visits} + \beta_6\,\textit{urban dummy} + \beta_7\,\textit{proprietary dummy} + \beta_8\,\textit{percent private patients} + \textit{error}.$$

Both total visits and visits squared have coefficients with signs indicating the conventional u-shape, although only the negative sign on visits is significant. If we take these numbers literally, the average cost function would reach a minimum at about 126,000 visits. This is much greater than the 7,000 skilled visits reported by Jay and Mandes (*1*). The strength of the negative portion and the statistical weakness of the positive portion, however, suggest that there is no significantly increasing portion of the average cost function. In other words, there may be no diseconomies of scale and no optimal number of visits.

Average costs increase as the average ADL score increases showing greater costs for those agencies serving a more dependent mix of patients. The coefficient is significant at the 5 percent level. This is rather strong evidence that a relationship between average costs and case mix exists, especially considering that some error must have been introduced by the fact that the total expenditure data were collected for fiscal year 1983, total visits were

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As expected, agencies located in high-wage urban areas also experienced significantly higher average costs. The final two variables had positive, significant coefficients revealing that proprietary agencies and agencies serving a large percentage of private patients did have significantly greater costs.

Conclusions

The evidence suggests that diseconomies of scale may not be associated with this industry. This is inconsistent with Hay and Mandes' (*1*) finding of substantial diseconomies of scale, but consistent with Kass' (*9*) finding that the cost function is virtually flat for firms producing near the mean. On the other hand, it seems likely from all the evidence that there is some initial range of output where average costs are decreasing. Both these effects taken together suggest that, if payments for publicly supported users of home health services are the same for all firms, profits are likely to be greater for larger agencies than smaller ones.

The significance of the proprietary and percent private pay patients variables in the equation helps to explain why patients served by proprietary homes and private patients pay so much for care. This, of course, does not rule out other explanations.

This paper presents evidence that a home health agency's case mix, measured by the number of dependencies per patient, is related to average costs. As mentioned, this finding is contrary to the conclusions of Hay and Mandes (*1*), the only other cost function study to address the question of whether agency costs vary with case mix. Differences in the methods of the two studies, however, may account for the different results.

Hay and Mandes (*1*) postulate a total cost function where the dependent variable is the total skilled nursing costs for an agency during a year. They regress this variable on output (measured by the number of skilled nursing visits in that year) and output squared to determine the shape of the firm's average cost curve. To test whether costs vary with the case mix, they include variables

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representing the shares of all costs that are devoted to various cost categories. They hypothesize that agencies serving more severely incapacitated patients will have a larger percentage of expenses devoted to indirect inputs (administration, clerical staff, office space, transportation, and office expenses) than to direct inputs (nursing inputs and medical supplies). Therefore, if the total costs increase with the percentage of costs devoted to indirect input categories and decrease with the percentage of costs in direct input categories, these relationships would indicate that costs are increasing with the severity of the agency's case mix.

Hay and Mandes base their conclusion that case mix probably is not related to costs on two results: the general insignificance of the cost share variables and the high R^2. Both pieces of evidence may, however, be influenced by the specification of their model.

Regarding the insignificance of the cost share variables, the assumed relationship between severity of case mix and the share of costs devoted to *indirect* costs is not intuitively obvious. Severity of case mix could reasonably be associated with a larger share of *direct* nursing and medical supply costs instead. For example, it seems just as likely that severely incapacitated patients would be long-term patients; therefore, the initial administrative and processing portion of their costs would be relatively small compared with the direct care portion.

Furthermore, even if it were true that the percentage of indirect costs was a good proxy for the case mix of the agency's clientele as hypothesized, their specification of this case-mix proxy variable might account for the lack of significance. The authors include five variables to represent the relative amount of indirect costs in their regression equation. Indeed, since indirect cost is a dichotomous variable, the sole direct cost variable—the

share of costs going toward medical supplies—also measures (negatively) indirect costs. As a result, the authors are measuring the same underlying theoretical construct with six variables. If these are all related to case mix (as is their contention), they are all theoretically correlated with each other, and multicollinearity may have been introduced into the equation. If the degree of multicollinearity is sufficiently large, it may render otherwise significant coefficients insignificant. If the case-mix variable is intended to be whether the home health agency's costs are indirect or not, then the most appropriate specification would be to include only one case-mix variable: the portion of all costs in the agency that are indirect.

Regarding the high R^2, Hay and Mandes argue that an R^2 of 96 percent implies that patient case-mix characteristics can at most account for only 4 percent of agency cost variation. Clearly, this conclusion does not permit the possibility that case mix is correlated with one of the included independent variables and is indirectly accounting for a portion of the explained variation. Moreover, their R^2 may also have been influenced by the total cost specification of their regression equation. That is, total costs must increase with output since an additional unit of output requires more resources, and these resources are not free. On the other hand, it is not clear whether average cost will increase or decrease with output. On the basis of specification alone, one might expect that a total cost function might have a higher R^2 than an average cost function. Therefore, their conclusion that at most only 4 percent of cost variation could be attributable to any omitted case-mix variables may be sensitive to their choice of dimension for the cost variable.

In addition, there are other studies that do not employ a cost function analysis, but nevertheless present evidence suggesting that costs increase with the dependency of the patient. For example, Manton and Hausner (*5*) show that patient dependency indices can be constructed that are significantly related to the reimbursement payments to home health agencies. Since these reimbursements reflect costs to some degree, we can reasonably conclude that this study also indicates that a firm's expenditures increase with case mix as measured by these indices.

If future research shows more conclusively that home health agency costs do increase with the dependency of the patient, this finding would suggest that a prospective payment system based on the case mix would be "fairer" and perhaps a more efficient use of government funds than a flat rate per visit. It does not, however, necessarily indicate that a case-mix reimbursement system is required to counter possible "cream skimming" on the part of home health agencies, such as occurs in the nursing home care markets. It is important to remember that, while care given by home health agencies may be regarded by some as a substitute for nursing home care, there are many differences between these two institutions and the markets in which they exist. Therefore, although nursing homes may choose among prospective patients on the basis of patient characteristics, it is not necessarily true that home health agencies will do the same.

The crucial difference is that many nursing homes face an excess demand for their care. This means that the number of patients they can serve is constrained by the number of beds they have in the short run, and certificate of need laws or construction moratoria in the long run. If there are more patients than beds available, prospectively paid homes with profit-maximizing objectives would naturally opt to serve patients with lower costs. Heavy-care patients would be excluded, even though the prevailing reimbursement rate is sufficient to cover the costs of their care, because nursing homes can make more money caring for the lighter-care patients (*10, 11*). With home health care, excess demand is less of an issue. If the demand becomes great enough, more care-giving personnel can be hired. Therefore, rather than turn down a customer, home health agencies will serve anyone that requests home health services, regardless of the severity of their incapacity, as long as revenues cover marginal costs. Consequently, cream skimming is not a reason to adopt case-mix reimbursement of home health agencies.

Research into the behavior of home health agencies is in its infancy. Most of the problems with research efforts to date (including those of this paper) can be traced to a lack of good measures for theoretically important variables. If the appropriate measures are not available, then researchers have been forced to use either distant proxies or omit the variable altogether. Clearly, all existing efforts would have benefited from having a more reliable and more comprehensive data set available. Given this lack of data, we can only hope for relatively crude approximations of the real underlying behavior. When these pioneering studies occasionally produce counterintuitive results, they force us to question our assumptions about reality and make further inquiries into the issue. To their

credit, they force us to root our knowledge and policy prescriptions in scientifically supportable evidence. As a result, we are less likely to make major policy errors, and the policies we do make are more likely to be effective.

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Runners' Health Habits, 1985–"The Alameda 7" Revisited

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Synopsis

Seven health habits were shown to be associated with longevity in a longitudinal study initiated in Alameda County, CA, in 1965. These habits (drinking moderately, exercising regularly, maintaining desirable weight for height, eating breakfast, not eating snacks, sleeping 7 or 8 hours per day, and never having smoked) were recently examined in a sample of the U.S. population. Subgroups with low income and little education were found to have low frequency of these health habits. In this report, findings on the frequency of these habits in 966 habitual runners in South Carolina are presented separately for men and women and according to age, education, income, and weekly mileage.

Subgroups of the runners are surprisingly similar to subgroups of the national sample for several health habits. In addition, among the runners, low-income groups and those with little education have a lower frequency of good health habits relative to the other groups, although these differences are not statistically significant. Overall, about half of the runners practice five or more good health habits. These results indicate that even among healthy runners there is need for improvement in the adoption of health habits thought to be associated with reduced morbidity and mortality.

In a 9-year followup to a longitudinal study initiated in 1965 in Alameda County, CA, seven health habits were identified that were associated with physical health status and low mortality (*1,2*). These habits were drinking moderately or not at all, exercising regularly, maintaining desirable weight for height, eating breakfast, not eating snacks, sleeping 7 or 8 hours per day, and never having smoked cigarettes. Researchers in several studies have attempted to describe the frequency of these habits in other populations and to relate these habits to health status. In a recent report on the frequency of the health habits in a sample of United States adults, important differences were

Home health care cost-function analysis

by Joel W. Hay and George Mandes

An exploratory home health care (HHC) cost-function model is estimated using State rate-setting data for the 74 traditional (nonprofit) Connecticut agencies. The analysis demonstrates U-shaped average costs curves for agencies' provision of skilled nursing visits, with substantial diseconomies of scale in the observable range. It is determined from the estimated cost function that the sample representative agency is providing fewer visits than optimal, and its marginal cost is significantly below average cost.

The finding that an agency's costs are predominantly related to output levels, with little systematic variation due to other agency or patient characteristics, suggests that the economic inefficiency in a cost-based HHC reimbursement policy may be substantial.

Introduction

Home health care (HHC) services represent a large and rapidly growing segment of the U.S. health care market. Federal HHC expenditures alone have risen at an annual rate of 30-50 percent over the past decade, and currently exceed $1 billion annually (HCFR, 1980). The HHC industry is now comprised of over 6,500 agencies providing close to $5 billion of HHC services (Mandes, 1982; Kleinfield, 1983). Despite the rapid expansion of HHC programs in both public and private sectors, little research has been carried out concerning market structure, production function, or cost-function analysis for HHC agencies. HHC is increasingly presented as a cost-effective alternative to expensive institutional care. Careful consideration of HHC's potential to augment or substitute for institutional care will require an understanding of the microeconomic characteristics of HHC agencies.

The HHC industry has been traditionally characterized by nonprofit agencies, both private (for example, Visiting Nurse Associations) and public (for example, city Public Health Nursing Departments), which have tended to divide the market into distinct geographic territories. As in the nursing home industry, however, the rapid expansion of HHC demand in the past 20 years has led to a substantial degree of market restructuring. Proprietary and hospital-based agencies have captured significant shares of both the public and private markets [1] (Monier et al., 1981). Territorial delineation of the market has thus been somewhat eroded.

Literature review

The economic literature has focused almost exclusively on determination of the cost savings potential of HHC services compared with institutional care. No studies of HHC agency production or cost functions have been made. Market structure analysis has been limited to descriptive statistics concerning the number of agencies in each provider class [2] (Monier et al., 1981).

Kurowski et al. (1979) provide a detailed analysis of Medicare cost per episode data from four Massachusetts and four Pennsylvania HHC agencies. They find a considerable variation across diagnosis code in charges per HHC episode. Although they do not compare HHC with institutional care directly, they suggest that institutional care may not be more expensive than HHC for some types of elderly patients currently receiving HHC services. Kurowski et al. (1979) present evidence of economies of scale in the provision of HHC services. However, their sample is limited to only eight HHC agencies and is not therefore well-suited to studying agency-level production or cost variation.

Day (1980) examines the utilization of HHC services provided by the San Francisco Home Health Services Agency to 7,420 clients between 1957 and 1975. Since only one HHC agency was involved, Day is unable to analyze issues relating to market structure or provider cost variation. She has information on private insurance and self-pay patients, as well as Medicare patients, and is thus able to compare the relative importance of patient demographic and diagnostic characteristics with the economic and financial incentives they face in consuming HHC services. Day finds the economic and financial factors to be more influential than demographic and diagnostic characteristics in explaining HHC utilization patterns.

Analytic approach

The selection of an appropriate economic model of behavior for nonprofit HHC agencies is not an easy task. Profit maximization would not, at first glance, appear to be an adequate behavioral description, and yet, as with the hospital sector, it may be an appropriate approximation in certain contexts. Revenue, output, or utility maximization (all subject to a zero-profit constraint) may better represent the motivation of nonprofit HHC agencies. Since the focus of this analysis is on the determination of costs, the underlying behavioral assumption is crucial only if it implies an agency utilization of inputs that is not cost minimizing for the chosen price and output combination.

[1] This is more correct in some regions of the country (for example, the South and West) than in others.

[2] For example, proprietary/nonprofit, free-standing/hospital-based, and so forth.

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Cost minimization will occur, however, as long as the agency objective function can be represented in the form

$$B(q(x)) - \lambda xr, \quad (1)$$

where $B(.)$ is a benefits function evaluated in monetary terms, $q(.)$ is a production function, x is a vector of inputs, r is a vector of input prices, and λ is a scalar normalization parameter. Eq. (1) includes as special cases competitive and monopolistic profit maximization, as well as output and revenue maximization subject to profit constraints. It is thus not limited to the traditional economic behavioral models.

Data and estimation methodology

The data were taken primarily from HHC agencies' 1981 cost reports submitted to the Connecticut Commission on Hospitals and Health Care. The study consists of all 74 traditional (nonprofit, noninstitutionally-based) HHC agencies. Nontraditional agencies were excluded because their cost reports were not directly comparable.[3] The data are based on costs incurred in the October 1980 to October 1981 period—$29.5 million in total costs (approximately 60 percent of the total State HHC market); these 74 agencies constitute the majority of the 117 State-licensed HHC agencies.

HHC agencies are multiproduct firms, producing services such as home health aide, skilled nursing visits, and, often, physical, speech, and occupational therapy visits. Moreover, nonprofit HHC agencies frequently produce a variety of nonHHC services, ranging from school health education programs to well-baby examinations. Instead of analyzing the entire range of services, skilled nursing visits was focused on as the output measure because it is the only service that all agencies provide, and it constitutes 45 percent of business for the study agencies. The agencies must report the portion of their costs that are allocable to skilled nursing visits for Connecticut Medicaid's rate setting.

Cost functions were estimated in this form,

$$C_i = a + b_1 Q_i + b_2 Q_i^2 + X_i d + e_i, \quad (2)$$

where C_i represents total skilled nursing costs for agency i; Q_i represents this agency's skilled nursing visits; X_i represents a vector of factors assumed to influence agency costs, and e_i is a random error term. The primary hypothesis of the analysis is examined through tests on the estimated parameters b_1, b_2. If b_1 is positive and b_2 is not significantly different from zero, the HHC agencies can be said to approach constant returns to scale as output increases. If b_2 is sufficiently positive, then the agencies demonstrate decreasing economies of scale and vice versa.[4]

[3]Starting in 1982, all HHC agencies in Connecticut were required to submit uniform cost-accounting reports.

[4]Technically, the agency demonstrates decreasing (increasing) economies of scale if $b_2 > (<) C/Q_i^2$, where $C = a + X_i d$.

Since the analysis is limited to publicly available data sources, many of the potentially important factors—that is, patient demographic, socioeconomic, diagnostic, and case mix measures, and so forth—were not obtainable. However, agencies' budget item cost shares were used as proxies to capture cost variation due to complexity and intensity of services provided. The justification for this approach is as follows: If certain patient characteristics systematically lead to higher costs for an agency (with quantity and factor prices constant), this will be reflected in a relatively greater percentage of resources being devoted to indirect inputs (that is administration, clerical, space, transportation, and office expenses) and a relatively smaller percentage of an agency's resources being devoted to direct medical care (that is, nursing and medical supply expenditures). Conversely, if patient characteristics do not affect the allocation of an agency's resources between direct and indirect inputs to HHC production (with output and factor prices constant), it is difficult to maintain that patient characteristics have a systematic impact on an agency's cost variation.

In line with this view, costs are hypothesized to increase as greater percentages of an agency's expenses are devoted to indirect inputs, reflecting a higher complexity of services, a relatively more difficult service population, or possible managerial inefficiency. Costs are expected to decrease as the direct care cost rises, reflecting a less complex service pattern, absorbing relatively less paperwork, record-keeping, analysis, or other back-up services, and more actual HHC services.

An additional variable representing the percentage of an agency's business devoted to skilled nursing visits is also included in the analysis. It is expected that if increasing economies of scale are found, the estimated coefficient of this variable will be negative, reflecting the advantages of specializing in skilled nursing services delivery for any given level of an agency's costs; the opposite will be true if decreasing economies of scale are found.

A set of regional dummy variables is included to pick up geographic variation in factor prices, regional income, demographic characteristics, and so forth. Agencies were grouped into the five Health Systems Agency (HSA) regions of Connecticut. A dummy variable indicating if an agency was an urban core provider is also included. It is expected that inner city agencies will be more expensive, reflecting the lack of private patients (given the lower socioeconomic status of their patient populations) and the higher urban wages and prices. Finally, a dummy variable, indicating whether an agency belongs to the Visiting Nurse Association or the Public Health Nursing Department provider is included. No *a priori* hypothesis concerning the sign of this variable's coefficient is posited.

Empirical results

The descriptive statistics and variable descriptions are listed in Table 1. The average cost per visit ranges from $13.85 to $50.88. The number of visits per agency ranges from 914 to 42,357. The percentage of business devoted to skilled nursing visits ranges from 22 to 87 percent. It is apparent that there is a broad diversity in an agency's size and manner of operations.

Table 2 presents the regression findings.[5] The key result is the positive and significant coefficients on VISITS and VISITS2, implying a U-shaped average cost curve with substantial diseconomies of scale within the observed range of an agency's size. For the sample representative agency, the estimated marginal cost is $23.20, significantly less than the average cost ($25.57), suggesting that the sample representative agency is providing less than the optimal number of visits. While this type of observed behavior is consistent with monopolistic profit maximization, it is not consistent with long-run competitive market behavior or with agency objectives, which leads to the overprovision of agency nursing services to promote social welfare. If the sample representative agency were trying to maximize revenue or output, subject to a zero profit constraint, it would be observed on the upward sloping portion of its average cost curve, not the downward sloping section.[6]

The representative agency's estimated average cost function, based on the Table 2 results, is

$$AC = 12044/VISITS + 20.31 + .000235\ VISITS.$$

This curve reaches its minimum at 7,159 visits, about 1,000 visits per year more than the sample representative agency. If all agencies were operating at the optimal production point, the potential savings to consumers Statewide would be about 10 percent of the $11.8 million spent for all sample agencys' skilled nursing visits.

At the margin, the agency could expand public HHC visits without losing money, since Government programs reimburse on the basis of average costs. If the sample representative agency were attempting to overprovide nursing services relative to profit maximizing behavior, as one might expect from a community service nonprofit organization, it would be observed at a point with marginal costs exceeding average costs.

Most of the other exogenous variables are not significant in the Table 2 equation, although the ones that are significant tend to conform to *a priori* hypotheses. Of the cost share variables, only MEDSUPLY is significant, and in the expected direction.[7] However, this observation provides only limited support for the hypothesis that variation in patient characteristics affects agency costs since variation in indirect input cost shares is not systematically related to costs.

The Fairfield County dummy variable (HSA1) is significant, confirming the effect of the relatively high cost-of-living in southwestern Connecticut. None of the other regional dummy variables are significant despite the large urban areas in HSA2 and HSA4. Surprisingly, the URBAN dummy itself is insignificant, suggesting that the patient or diagnostic case mix characteristics of core urban HHC agencies are not sufficiently different to cause systematic variation in total agency costs. The HHCPRCNT variable is significantly positive, which is also consistent with *a priori* expectations.

Home health services are highly labor intensive (particularly skilled nursing visits), and individual HHC agencies may be presumed to be sufficiently small purchasers in the nursing labor market so as to have little impact on nurse market wages. The question of why the estimated average cost function does vary with output is thus reasonable. These data are not detailed enough to allow examination of the factors leading to curvature of the average cost function. It would seem that the small agencies (that is, less than 4,000 visits annually) may face visit scheduling inefficiencies leading to nursing staff downtime or suboptimal transportation routing. Large agencies may fall victim to excessive administrative complexities.

The R^2 statistic for the regression is .96, implying that omitted variables, such as patient characteristics, can only account for an additional 4 percent of agency cost variation. This R^2 value is high for a cross-sectional regression, particularly relative to most health care data. However, in comparison with hospital or physician production or cost regressions, HHC agencies provide a relatively uncomplicated set of services.

To explore the robustness of the estimated results, a number of other specifications were examined. Both logarithmic and double-log cost functions were estimated, but the results were not substantively different from those in Table 2. Moreover, the resulting average and marginal costs were not as tangibly representable in monetary terms.

To examine further whether omitted-variables biases, due to systematic differences of large urban HHC agencies, could be detected, all agencies with more than 16,000 visits were deleted from the sample. This sampling rule led to the exclusion of the seven largest Visiting Nurse Associations, representing 35 percent of the sample agency output. Estimated coefficients for the resulting subsample concurred closely with the Table 2 results in terms of signs and signifi-

[5]To correct for heteroskedasticity, observations were weighted by the inverse square root of VISITS.

[6]If agencies were constrained by demand to the downward sloping portion of their average cost curve, one would expect agency mergers to lower unit costs of production in the absence of local barriers to entry. This would follow *a fortiori* if agencies were optimizing social welfare.

[7]NURSE was omitted from the final specification since the sum of cost share variables is perfectly collinear with the constant term.

Table 1

Variable descriptions

Variable	Definition	Mean	Standard deviation	Sum	Minimum	Maximum
VISTCOST	Average cost per skilled nursing unit	25.575135	6.32906	1892.5600	13.8500	50.8800
ADMIN	Share of allocable costs going to agency administration	0.143188	0.06941	10.5959	0	0.4291
NURSE	Share of allocable costs going to nursing salaries and benefits	0.319206	0.12462	23.6213	0	0.7477
CLERIC	Share of allocable costs going to clerical expenses	0.093484	0.03340	6.9178	0	0.2156
TRANSPT	Share of allocable costs going to transportation expenses	0.035667	0.02902	2.6393	0.0058	0.2402
MEDSUPLY	Share of allocable costs going to medical supplies	0.006854	0.00601	0.5072	0.0010	0.0355
SPACE	Share of allocable costs going to space occupancy expenses	0.024152	0.01842	1.7872	0	0.0996
OFFICE	Share of allocable costs going to office expenses	0.024196	0.01535	1.7905	0.0037	0.1273
HSA1	Fairfield County Health Systems Agency (dummy variable)	0.121622	0.32908	9.0000	0	1.0000
HSA2	New Haven County Health Systems Agency (dummy variable)	0.121622	0.32908	9.0000	0	1.0000
HSA3	Eastern Connecticut Health Systems Agency (dummy variable)	0.324324	0.47132	24.0000	0	1.0000
HSA4	Hartford/Tolland Counties Health Systems Agency (dummy variable)	0.243243	0.43197	18.0000	0	1.0000
HSA5	Northwestern Connecticut Health Systems Agency (dummy variable)	0.189189	0.39433	14.0000	0	1.0000
URBAN	Agency serves core urban community (dummy variable)	0.094595	0.29465	7.0000	0	1.0000
VNA	Agency is a Visiting Nurse Association (dummy variable)	0.554054	0.50048	41.0000	0	1.0000
INTEREST	Share of allocable costs going to interest payments	0.001775	0.00555	0.1313	0	0.0271
OVERHEAD	Share of allocable costs going to other expenses	0.045175	0.02865	3.3429	0.0051	0.1837
VISITS	Annual number of skilled nursing visits	6247.45	7230.89	462312.	914.	42357.
COST	Total annual agency costs allocable to skilled nursing	159742.78	206724.72	11820965.94	24987.24	1405405.26
VISITS2	VISITS × VISITS	90609979.	258148981.	6705138452.	835396.	1794115449.
HHCPRCNT	Percentage of agency business devoted to skilled nursing (subcontractual services are excluded)	0.442663	0.13101	32.7570	0.2276	0.8850

Table 2

GLS regression: Dependent variable is COST

Parameter	Estimates	Parameter = 0	PR > | T |
INTERCEPT	− 10282.9472	− 0.69	0.4935
ADMIN	− 36879.0767	− 1.07	0.2901
CLERIC	− 3938.6991	− 0.05	0.9594
TRANSPT	43958.7214	0.37	0.7109
MEDSUPLY	− 838595.5544	− 1.96	0.0553
SPACE	130613.7147	0.99	0.3252
OFFICE	105995.6836	0.49	0.6284
HSA1	29189.3691	2.67	0.0098
HSA2	9754.4364	0.94	0.3526
HSA3	589.2250	0.08	0.9376
HSA4	2885.4332	0.36	0.7204
URBAN	− 19000.3673	− 0.80	0.4293
VNA	− 107.3178	− 0.02	0.9848
VISITS2	0.000235	3.98	0.0002
VISITS	20.3113	11.65	0.0001
HHCPRCNT	49985.0336	2.65	0.0104

N = 74
R − Square = 0.9599

cance. The implication is that the larger HHC agencies appear to fit the same cost function as the smaller ones.

Conclusions

Any conclusions based on this research should be characterized as tentative. The primary limitation of the analysis is the lack of numerous patient and agency characteristics that might be hypothesized to influence agency costs, but are not reported to the State rate-setting commission. Further investigation of HHC agency cost and production variation would benefit from detailed collection of data on agency and patient characteristics.

The generalizability of these findings beyond Connecticut is conjectural. By focusing on intra-State cost variation, the analysis has controlled for State to State differentials in regulatory and market conditions. However, Connecticut has a relatively highly regulated HHC market. Young and Fisher (1980) report that costs per HHC episodes and utilization rates for Medicare HHC services are significantly higher on an average in New England.

Despite these caveats, certain results deserve comment. The analysis shows a strong and robust relationship between total cost and output levels. The relationship does not appear to be substantially mediated by broad agency characteristics—that is, cost share variation, urban core location, type of provider, or HSA location. This observation raises the possibility that more detailed agency and patient characteristics will not substantially reduce residual cost variation. HHC agencies do not provide services as technically varied or complex as those provided in hospitals, thus agency cost variation is likely to be much less sensitive to provider-patient mix than would be the case for hospitals and other health care institutions.

The finding of marginal cost lower than average cost for the representative agency raises intriguing questions regarding agency objectives. It is not consistent with competitive market behavior or with behavioral models that suggest a generous provision of services to maximize the agency's social welfare function. The finding is consistent with a view that agencies place the goal of institutional survival above that of maximizing patient services within a given budget. While it is possible that because of chance a period of short-run disequilibrium was observed in an otherwise competitive market, the agencies in our sample have maintained the same relative sizes for many years. Further analysis of panel cost data will shed light on whether the nonoptimality of agency costs per visit is a temporary phenomena.

A more plausible explanation of the observed noncompetitive HHC market structure centers around the cost-based reimbursement methods used by Government programs (for example, Medicare and Medicaid) and health insurers to pay for HHC services. Since a large percentage of a traditional agency's skilled nursing visits is reimbursed by third parties, on an allowable cost basis, there is little incentive for an agency to produce at the minimum point on its average cost curve. Data on agency revenues as well as their costs is needed to determine (1) why agencies tend to produce at a point to the left of the minimal cost point and (2) how they price services to public and private patients. These questions are beyond the scope of this analysis.

If these empirical results are to be believed, cost-based reimbursement may not be appropriate in the HHC market. The justification for using an allowable cost-reimbursement mechanism is that market-determined prices will penalize those agencies that provide care to relatively sicker and, hence, costlier patient populations. If market mechanisms are substituted for cost-based reimbursement, agencies may compete to "cream skim" the healthiest patients so as to minimize their costs per visit. While there may be merit to this argument in the institutional health care setting, the finding that HHC agency costs are predominantly related to output levels, with little systematic variation due to agency characteristics that can be

associated with patient case mix, suggests that the cream skimming may not be a plausible HHC strategy to reduce costs per visit. Furthermore, the economic inefficiency inherent in an HHC cost-based reimbursement policy may be quite substantial.

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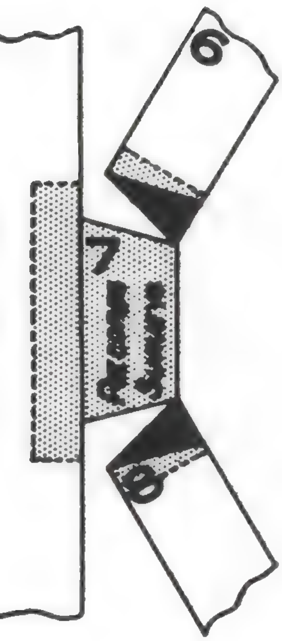

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HOME HEALTH AGENCY PROSPECTIVE PAYMENT DEMONSTRATION

HCFA Contract No. 500-84-0021

Report on Project Design

Working Draft

February 16, 1990

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1.0 INTRODUCTION

1.1 Purpose of the Demonstration

Over recent years, the Medicare home health benefit, while becoming an increasingly significant part of the Medicare program, has been beset by increasing organizational and administrative complexity and escalating costs. Congress and the home health industry have singled out prospective payment for home health services as a potential means of addressing these problems. Prospective payment has the potential to simplify program administration and participation and to encourage provider efficiency.

In order to study some alternative payment methods and test their effects prior to instituting any change in Medicare policy, the Congress mandated a demonstration project for home health agency prospective payment. The Omnibus Budget Reconciliation Act passed in December 1987 directs the Health Care Financing Administration to implement a demonstration that builds on the one previously begun by Abt Associates Inc. under contract with HCFA.

This demonstration will collect systematic data on home health agencies and their responses to alternative payment incentives. In the development of a research design, care has been taken to meet the requirements of the evaluation and to select agencies in an objective and unbiased manner.

The objectives of the demonstration are to:

- Design and test two very different prospective payment methods with differing incentives for HHAs.
- Study the response of HHAs to particular methods in terms of behavior, service and case mix.
- Assess which method encourages the most desirable responses in terms of efficiency and effectiveness.
- Assess the ability of each method to simplify program administration while preserving effective management.
- Assess whether prospective payment is preferable to the current system of reimbursement.

- Learn whether prospective payment can contain costs without curtailing quality, appropriateness, and access to services, or simply shifting costs to other payors.

The demonstration has been designed to provide data to answer these questions. The design will allow an independent evaluation contractor (to be selected by HCFA) to assess the extent to which these questions have been answered, and in what direction. This information will be used to inform policy decisions on what changes, if any, to propose in Medicare's payment structure for home health care.

1.2 The Idea of Prospective Payment

Several issues in home care have contributed to the current level of interest in prospective payment for home health services. First is the growing importance of home health care in the Medicare budget. It now accounts for over $2 billion in expenditures, and serves over 1.6 million beneficiaries (roughly 6 percent of the total). Growing numbers of elderly, particularly the very old, are expected to contribute to more growth in the future. The number of providers has also been growing steadily over the past several years, and is expected to continue as hospitals continue to enter this market, and as recent events (such as the Staggers decision) increase the services available to Medicare beneficiaries. The incentives of Medicare's hospital payment system (PPS) have also contributed to increased use; shortened stays, and more care needs at discharge have contributed to greater home care demand post discharge. All of these factors increase concerns about the growing expense of home care, and hence interest in promoting efficiency. Prospective payment is viewed as one way to redirect incentives from the current inflationary cost-based system and move providers towards more cost-conscious behavior.

A second impetus for the demonstration has been provider interest that was raised to new levels by the administrative problems of the mid-1980s (the so-called "denials crisis"), and subsequent perceived increases in Medicare cost report disallowances at audit. Prospective payment is perceived as a way to simplify the Medicare home health program and provide HHAs with increased certainty regarding reimbursement levels.

1.3 Other Providers' Experience with Prospective Payment

This section reviews the experiences of prospective payment applications for other groups of health care providers. Information on provider behavior in response to similar incentives may be useful in designing home health agency payment methods.

HOSPITAL APPLICATIONS OF PROSPECTIVE PAYMENT

Applications of prospective payment incentives for health care providers have a rich history in the hospital sector. Although the lessons learned about prospective payment in hospitals have only limited application to the home health industry, the varied experiences in payment approaches implemented by federal agencies and states in the last decade, and the wealth of impact research that has been done on these programs, provide a good starting point for considering prospective payment options in the home health industry.

Since 1969, more than 30 prospective payment programs, some mandatory, some voluntary, have been implemented on a national, state, or substate level by various payor groups for hospitals. These programs have included many approaches to setting rates, ranging from establishment of budget limits, per diem rates, and rates for each episode of hospitalization, to rates for units of service within the hospital. It is fair to say that most of these programs

have very little in common in terms of program design; however, they do all attempt to put the provider at risk for certain levels of health care spending.

The considerable body of research on the impact of these programs yields a consistent set of findings with respect to prospective payment incentives (Gaumer and Lee, 1980; Biles, 1980; Coelen et al., 1983). In spite of the enormous differences in rate setting methodology, the large and accumulating literature on the impacts of these programs suggests that mandatory prospective payment for hospitals has encouraged institutional administrators to respond to payment incentives by reducing rates of increase in expenditures. This is a remarkably resilient finding--holding up across programs that limit total budgets, set rates by formulae, screen rates by peer comparisons, incorporate case mix adjustments, and the like.

The research to date also indicates that prospective payment programs make administrators extremely sensitive to the volume of service provided. Evidence that practice patterns have changed in response to prospective payment programs is shown in the finding that, during the decade of the 1970s most hospital prospective payment programs encouraged increases in lengths of stay, since per diem payment programs were popular. In contrast, the per case systems in several states in the 1980s have led to strong decreases in lengths of stay. Obviously, administrators have a tendency to adapt to the volume incentives that are reflected in the basis of payment. Prospective payment incentives have also affected patterns of care in the form of reductions in ancillary service use. These and other changes in practice patterns are also evident in early statistics from the Medicare PPS system. The case-based system, as might be expected has apparently accelerated already existing trends to shorter lengths of stay.

It is obvious from earlier studies of prospective payment administration (Hamilton, 1979) that the rate setting methodology must communicate clear "signals" to providers in terms of intended actions to contain costs. Unnecessarily complex approaches can be confusing to administrators, posing a barrier to effective managerial response. This is important because, at the core, prospective payment programs are aimed at controlling the revenue stream of providers. The extent to which costs are contained is a matter of administrative prerogative. Consequently, in order for a program to be effective over time, the stream of costs must be reduced to match the reduced inflow of revenue; this requires administrators to change the ways in which care process and resource allocation decisions are made in order to change the stream of expenditures.

Maintaining equity across the institutions while recognizing fully any inherent similarities and differences in the service needs in particular institutions has been a major concern of payment methods to date. Prospective payment programs in hospitals have dealt with this problem through evolving refinements in peer grouping techniques and explicit adjustments for case mix in the rate setting process. Concern continues to exist, even in the case of hospitals, however, about the ability of diagnostic groupings of patients (DRGs) to capture inter-institutional differences in case mix, and hence, their ability to solve the equity problem fully. This is clearly an even more serious problem in the case of home care, where patient classification systems are not well-developed, and there is virtually no consensus on the capacity of alternative classification systems to capture all differences in costs.

Another problem observed in hospitals over the last decade has been extreme sensitivity of volume of services provided to the nature of the reimbursement incentives being applied. For example, early versions of many

prospective payment programs led to dramatic increases in volumes of services and, consequently, unintended increases in expenditures (Hamilton, 1979; Coelen, et al., 1983). This is a particularly critical problem for home care, because "service units" are the natural payment unit (episodic periods are more difficult to conceptualize), and with such reimbursement systems, perverse volume incentives may be created unless explicit penalities or limits are used. Case-based payments are seen as one way to neutralize those incentives.

HOSPICE REIMBURSEMENT EXPERIENCE

The hospice program of prospective payment is of interest here since these rates have been set prospectively based on level and intensity of care. Regulations implementing the TEFRA hospice benefit under Medicare set prospective rates for standard inpatient and respite care days, and flat rates for two types of home care days:

- routine home care covers the services of nurses, home health aides, and therapies (as currently covered under Part A) plus other hospice home visits (social services, nutritional counseling), equipment and supplies and an allowance for the interdisciplinary team that manages hospice care;

- continuous care, for which hospices are reimbursed over a range of continuous care "days" in two groups: an 8 to 16 hour day and a 20 to 24 hour day.

Although hospice rates are not set to differentiate between programs operated by hospitals as opposed to home health agencies, they do implicitly account for differences among facilities in patient mix and pattern of practice, by paying more for "difficult" cases that require expensive continuous care. On the other hand, limits on utilization of continuous care and of inpatient days, limits on covered days to which the Medicare benefit applies for each eligible beneficiary, and regional caps on total reimbursement per

year (adjustment annually for inflation) for the hospice should restrain excessive utilization.

Issues confronted by HCFA in developing hospice regulations must also be addressed in designing a prospective home health care reimbursement system. In particular, how can such a system take into account large differences among providers and marked variations in service intensity and mix, and still avoid creating an overly complex system? National Hospice Study data show the considerable range in costs among home health-agency-based and hospital-based hospice providers of home care. Costs per day at home ranged from $27 to $89 for HHA based providers, and from $17 to $143 per day for hospital-based providers. These figures are matched by a similarly wide range of cost per unit of service (home care hours), from $15 to $67 for HHA based hospices and from $19 to $99 for hospital-based programs. Although some of this dispersion reflects wage differentials among regions that can be covered by the current practice of indexing the national rates, much of the differential is based on structural factors such as organization and staffing practices. For example, skilled nursing hours as a percent of total hours range from 5 percent to 49 percent of total hours in HHA programs, and from 4 percent to 63 percent in hospital-based programs.

Intensity variations also had to be built into the hospice payment system. Episodes were composed from "average" days of care across patients. this is one way to accommodate fluctuations in intensity within a case, as well as variations across cases.

1.4 Contents of this Report

This report outlines the design of a demonstration to test the economic and patient care impacts of two distinct payment methods implemented in 100

agencies in five states. Phase I is spent on design, recruitment and training of agencies, and calculation of payment rates. Phase II is a three-year implementation phase plus the necessary phase-in period, and includes monitoring of quality of care and agency experience based on site visits and periodic reporting. Phase III will consist of a phase-down period and preparation of a final report for the demonstration. Actual evaluation of the effects of the demonstration will be the responsibility of the evaluation contractor.

There are two principal limiting factors on the study design. The first is the *restrictive domain* of the demonstration, excluding several possible incentives for greater efficiency. Current service and coverage policies will be maintained, so it will not be possible to completely assess the results that might have been gained from flexibility in these areas. The Section 223 Cost Limits will not be waived, so agencies will still be operating under those reimbursement constraints. Incentive payment for durable medical equipment (DME) and other equipment is also omitted, principally because of the difficulty of providing equitable prospective rates in the face of extremely rapid technological and marketing change in these elements of cost.

The second design limitation is simply the *paucity of data and prior studies* of Medicare home health services and patients. This limitation prevents development of patient classification, or DRG-type rate schedules, such as those being used in hospitals. In the absence of prior experimentation it is also impossible to focus on finer points of alternative payment approaches or on subtle variations in them. Instead we are studying two widely varying alternatives to cost-based reimbursement designed to test broad incentives, so that policy decisions can be informed by the effects of the most basic payment options. While the demonstration is gathering data suitable for analyzing

patient classification and case mix adjustment approaches, the absence of these data at this time is possibly the greatest current barrier to moving quickly to a national prospective payment system for home care.

This design report contains the following chapters: Chapter 2 describes the recommended payment methods being tested, their incentives, and the process to be followed in computing rates for participating providers; Chapter 3 describes the process of sampling states and home health agencies within states. Chapter 4 describes the project's implementation plan, including the process of recruiting agencies, ongoing data collection obligations from the study sites, and the functions of the intermediary. Chapter 5 outlines some of the pertinent issues in setting payment rates and a detailed description of the process of setting and adjusting prospective rates during the demonstration. Finally, Chapter 6 provides a potential plan for the evaluation of the demonstration emphasizing the issues to be studied and a data collection plan for the evaluation.

2.0 OVERVIEW OF PAYMENT METHODS

Design Constraints

The prospective payment methods chosen for the demonstration were developed to satisfy evaluation needs within a design framework that is both simple and practical. At the same time, several aspects of the design were dictated by external constraints. The most important design constraint was the voluntary nature of provider participation in the demonstration. Generalizable results could not be assured had the payment methods systematically discouraged participation by a particular class of providers, such as those with higher costs. Several elements of the design, such as the setting of agency-specific rates and limitations on risk, were adopted to encourage participation by all types of providers.

An additional constraint was posed by the dearth of available information on the determinants of expenditures in the home health industry and the likely response of providers to various payment incentives. These considerations led us to select two distinct methods of payment that vary in their incentives in order to yield sufficient evidence for adopting a particular approach to prospective payment should subsequent evaluation indicate that this would be in the best interests of the Medicare program.

A final constraint was posed by the need for each method to be as simple and straightforward as possible. State and federal prospective payment programs for hospitals often contain complex methodologies involving screening of allowable cost levels, exceptions, retrospective adjustments, and intricate carry-forward provisions. Many systems involve penalties and bonuses as well. While procedures such as these may be needed for establishing the exact

mix of "carrots and sticks" that are desired, they pose two problems for the demonstration.

First, and most important, with such complex systems it is not always easy for the provider to understand exactly what signals are being given by the rate-setting approach in terms of preferred actions. This is especially problematic for a demonstration aimed at observing the direction and likely magnitude of provider responses to the reimbursement incentive systems. Confusion on the part of providers can only generate confusing and tentative responses, which will not aid the evaluation in delineating the "pure" consequences of particular types of payment incentives. Even if provider behavior is systematic under a complex system, it is most definitely <u>not</u> possible for researchers to identify which features of that complex system were responsible for the observed changes in behavior.

Second, a simple system is much easier to implement successfully. It is easier to explain to providers during recruitment. Complexity delays the decision making process and increases the possibility that one among the decisionmakers for a particular provider will oppose the payment scheme. Simple methods are easily communicated by recruitment staff, can easily be communicated and understood by relevant provider decisionmakers, and will yield the most easily interpreted research findings.

<u>General Principles of Rate-Setting for the Demonstration</u>

The two prospective payment methods have been structured to comply with five principles of rate-setting:

1. <u>Budget Neutrality at the Agency Level</u>

   Under both payment methods, specific rates for each provider are computed, based on that provider's Medicare-reimbursable cost

during the base period. Rates are computed so that each individual provider would have been neither better off nor worse off in the base period had the prospective rates been applied during that period. This principle was adopted to minimize the problem of selection bias in a voluntary demonstration. Rates based on external information such as regional rates or average national Medicare reimbursement levels constitute the only alternative to the agency-specific rates to be used in this demonstration. Such externally based rates would virtually guarantee that providers with high costs would not participate in the demonstration (and that providers with low cost would be eager to participate). This would severely limit the generalizability of the results and might violate the congressional restriction that the demonstration not increase Medicare expenditures.

2. <u>Rate-to-Rate Annual Adjustments</u>

Rates for the second and third fiscal years of the demonstration will not be recalibrated on the basis of incurred costs in the prior year. Instead, rates will be "rolled forward" from year to year, adjusting only for inflation and other year-end outcomes as discussed in Chapter 5. This approach is important because it provides strong and continuing incentives for providers to be efficient and economical in their use of resources. If rates are recalibrated on the basis of incurred costs, there will be little incentive to economize -- providers that are less efficient would be held harmless in the second year for poor productivity in the first year. On the other hand, providers that are extremely efficient in the first year would have their rates reduced in

subsequent years. The "rate-to-rate" approach eliminates such perverse rewards and penalties and provides the incentives necessary to generate substantial behavioral changes.

3. Limitation on Agency Risk

Providers may be reluctant to participate in the demonstration because of the risk of loss inherent in any prospective payment approach. While this risk is perceived as substantial for agencies receiving payment under the per-episode method, it is also a factor for per-visit agencies whose costs could increase due to external factors (e.g., an increase in the minimum wage). For this reason, the maximum possible loss for agencies paid under the demonstration will be capped at five percent. Losses in excess of five percent of Medicare-reimbursable costs will be reimbursed by HCFA up to the Section 223 routine cost limits. (All agencies will continue to be at full risk for costs in excess of the 223 limits.) To balance the cost of this protection, and to limit the potential for inappropriate windfall profits, HCFA will share in a portion of HHA profits above a defined threshold.

4. Adjustments for Fixed Costs

Recognizing the fact that certain provider costs are relatively fixed and do not vary directly with the volume of visits provided (e.g., administrative salaries, other administrative costs, etc.), agency payments under the per-visit method will be adjusted if there is a large change in visit volume relative to the previous year. An agency whose volume falls will receive a higher reimbursement per visit; an agency with a large increase in visit volume will receive a decreased per-visit payment.

5. <u>Exclusion of Durable Medical Equipment and Certain Services</u>

During the demonstration, durable medical equipment (DME) will not be included in the prospective rates, but rather will be reimbursed retrospectively on the basis of the Medicare Cost Report or the new reimbursement procedures currently being developed for certain types of equipment. The decision to exclude DME is based on its rapidly changing technology and its varied use in the home, making the establishment of bundled rates extremely difficult. The complexity added by other issues, such as the decision to rent or purchase equipment and the ongoing reassessment by many agencies of their role in DME provision, argue further for exclusion of DME from the demonstration.

Services provided to Medicare beneficiaries under the Medicare Part B benefit will also not be covered. Part B home health services are provided relatively rarely (mainly therapies on an ambulatory basis or services to beneficiaries without Part A coverage), and are paid by carriers rather than fiscal intermediaries. Incorporating copayments and deductibles into the payment rates would needlessly complicate the demonstration and yield virtually no insights into agency behavior.

Finally, agencies that <u>begin</u> to offer new reimbursable services (such as Medical Social Services) during the demonstration will be reimbursed for these services at cost for the duration of the demonstration. The relatively short duration of the demonstration will probably not allow time for an agency's cost experience with

new services to achieve the stability needed to support the development of equitable payment rates.

Summary of Payment Methods

Home health agencies that participate in the Prospective Payment Demonstration will be assigned to one of three groups, each corresponding to a different method of payment for Medicare covered services under the Part A benefit. One of these is a control group, in which home health agencies will receive Medicare reimbursement in the same fashion as those agencies not participating in the demonstration. Agencies assigned to the other two groups will be paid using one of the two types of prospective payment systems to be tested in the demonstration project. These are 1) payment per visit (by type of service), and 2) payment per patient episode of care. These two payment methods are summarized briefly below and in greater detail in Chapter 5. A total of 90 agencies will be included in the primary demonstration sample; thirty will be assigned to each group. An additional 10-agency sample of agencies located in rural areas will be included in the demonstration, allocated among the two prospective payment methods and the control group.

- Payment Method 1: Per Visit

Under this method, a rate per visit for each of the six Medicare-reimbursable visit types (skilled nursing, physical therapy, occupational therapy, speech therapy, medical social services and home health aide) is set for each agency. Base period costs attributable to each discipline will be used to calculate the six per-visit rates. Each year, the per-visit rates will be adjusted for inflation using the HCFA Market Basket Index.

• <u>Payment Method 2: Per Episode of Care</u>

Under this method, agencies will receive a single flat payment for each episode of care, regardless of length, up to 120 days following admission. Should a patient's length of stay exceed 120 days, payments for this patient will switch to the per-visit method for services delivered beyond the 120th day. As under the per-visit method, rates will be adjusted each year based on changes in the HCFA Market Basket Index. There will be a further retrospective adjustment under the per-episode method to compensate for changes in agency casemix.

<u>Incentives and Risks</u>

Each payment method allocates risk for behavior patterns differently between the agency and the government. Under cost reimbursement, which will be used for the control group, the government is at risk for all Medicare costs up to the Section 223 limits. Under the per-episode method, the agency bears risk for cost per patient (mitigated slightly by the casemix adjustment), leaving the government at risk only for increases in cost associated with increased patient load. Under the per-visit method the agency is at risk for changes in the efficiency of visit production, and the government is at risk for other cost factors. This differential allocation of risk creates incentives for agencies in different payment groups to increase or decrease particular dimensions of service. Exhibit 2.1 displays the allocation of risk for each component of cost. In identifying the components, total cost is defined in the following way:

Total cost = (cost/visit) x (visits/episode) x (episodes/patient)
x (number of patients)

The Medicare program is at greatest risk under cost reimbursement (control group); the agency is at greatest risk under the per-episode method.

Exhibit 2.1

National Home Health Agency Prospective Payment Demonstration

Allocation of Risk Under Alternative Payment Methods

	Cost Component			
Payment Method	Cost Per Visit	Visits Per Episode	Episodes Per Patient	Number of Patients
Control Group (Cost Basis)	G	G	G	G
Per Visit	A	G	G	G
Per Episode	A	A	G	G

Key: A = Agency

G = Government (Medicare Program)

Agencies have clear incentives to contain components of cost for which they are at risk (indicated by the letter 'A' in Exhibit 2.1). All agencies in the two prospective payment groups therefore have an incentive to reduce cost per visit, if possible, since savings in cost per visit are theirs to keep. Agencies have no clear incentives to contain components of cost for which the Medicare program is at risk. No agency will necessarily wish to reduce the number of admissions, since admissions trigger additional revenues, regardless of the payment method (including current policy). Whether agencies will actually seek to increase admissions depends on the magnitude of their prospective payment and the opportunity to expand provided in their marketplace. Agencies that wish to maximize their budget surplus will encourage admissions so long as the expected payments to the agency arising from the admission exceed the increased cost attributable to that admission.

3.0 SAMPLE DESIGN

The study parameters call for selection of 90 home health agencies (HHAs) from 5 states for the primary demonstration sample plus 10 agencies in rural areas in one or more of those states for the special rural substudy. (While, it would be desirable to include a larger number of agencies in a larger number of states, we are precluded from doing so by the high implementation and evaluation costs of such an expansion.) The 100 agencies will be assigned to one of two treatment groups (i.e., payment methods) or a control group. The agency sample design serves as a framework for generating participants in a demonstration. Therefore, the design must explicitly ensure that relevant and potentially confounding agency attributes are represented in sufficient number to yield statistically meaningful results, or are otherwise controlled for.

The need to ensure the presence of relevant agency attributes calls for a sampling design which is stratified according to the dimensions felt to be most crucial to the outcomes of the demonstration project. These dimensions will be discussed below. Random sampling of agencies within each stratum and random assignment to payment methods are essential to the validity of the demonstration; randomization provides the best guarantee that factors which are not incorporated explicitly into the stratification design will exert essentially random influence on the outcomes. While comparisons between single agencies (e.g., one agency in a treatment group and one in a control group) will be sensitive to these random variations, aggregations of agencies by treatment, or analysis within appropriate multivariate frameworks, give some assurance of adequate control for extraneous effects.

3.1 The Primary Demonstration Sample

This section presents the design and selection of the primary demonstration sample. Selection of the sample for the special rural agency substudy is described in Section 3.2.

Defining the Universe

The sampling universe of agencies for the primary demonstration sample has been restricted in three ways:

1. Government agencies were excluded.
2. Newly formed agencies were excluded.
3. Non-urban agencies were excluded.

These restrictions are discussed below.

Government agencies constitute a distinct group in terms of payment incentives, organization and financial control. These agencies are therefore likely to respond to the treatments in ways that differ from the responses of non-government agencies. In particular, they are probably less sensitive to variations in reimbursement schemes and their inclusion would thus probably fail to generate useful information for two reasons. First, these agencies' responses will vary little, if at all, across payment methods. Second, it is home health care provision by private, rather than government, agencies that is targeted for payment reforms, primarily because of the lessening importance of government HHAs in servicing Medicare program needs. Thus, for both statistical and policy reasons, government agencies have been excluded from the demonstration.

The sampling universe was also limited to more "mature" agencies, with some years of experience in the home health industry and the Medicare

program. Recently formed agencies are likely to exhibit unique cost and administrative practices. Newer agencies may also show unique preferences for electing to participate in the experiment. For these reasons, we have limited the universe of eligible agencies to those that were active in the Medicare program prior to January 1, 1987.

Finally, it was decided to include only agencies operating in Metropolitan Statistical Areas (MSAs) in the primary demonstration sample, for several reasons. First, the vast majority of Medicare payments are made to such agencies, and it is in these areas that the industry has grown and is likely to grow in the future. Second, the inclusion of non-urban agencies introduces a potentially important factor for the demonstration outcomes that is difficult to control for in a sampling design involving only 90 agencies. However, recognizing that the demonstration may form the basis for future policy decisions affecting rural, as well as urban, agencies, we are including a 10-agency rural sample in the demonstration to provide some basic information on the response of rural agencies to prospective payment. This special rural substudy is described in Section 3.2 below.

The three criteria that have been discussed jointly define the sampling universe of HHAs for the primary demonstration sample: non-government agencies in urban areas which were active before January 1, 1987.

State Selection

The primary demonstration sample is composed of agencies located in five states. Stratification by state was done for two reasons: (1) it is important to have adequate numbers of study agencies in each state so that state-level influences on agency behavior (principally CON, licensure, and

Medicaid reimbursement policy) can be controlled for in measuring the impact of reimbursement incentives; (2) administrative convenience - gaining agency participation, setting and revising rates, and gathering Medicaid data are all facilitated by concentrating study sites in several states.

The demonstration will be conducted in the following states:

- California
- Florida
- Illinois
- Massachusetts
- Texas

These states were not selected in a random fashion. Criteria governing the selection process included:

- geographic dispersion across the country;
- adequate numbers of HHAs available to satisfy sampling requirements within design strata and allowances for replacement;
- limited presence of factors which might confound or limit generalizability of study results.

1. California. This state has a large number of agencies of all types, including hospital-based and free-standing agencies, and its population configuration will allow clustering of agencies in specific geographic areas. This state will be the representative of the West Coast.

2. Texas. This state, like California, has a large number and variety of home health agencies, and will support clustering in Dallas/Ft. Worth, Houston, and San Antonio/Corpus Christi. Texas home health agencies are undergoing rapid growth and change, and while changes cause some evaluation problems, the inclusion of HHAs whose caseloads might be changing permits meaningful testing of payment methods and incentives.

3. Illinois. Illinois possesses a sufficient number and variety of agency types for the demonstration. The existence of Chicago and several

other proximate major urban areas (Springfield, Peoria, Decatur, Bloomington) also permits implementation of the clustering design.

4. Florida. This state has a large number of HHAs, but has a fairly small proportion of voluntary agencies. HHAs included in the sample frame are located primarily in Miami/Ft. Lauderdale, Tampa/St. Petersburg, Orlando and Jacksonville.

5. Massachusetts. This state has a sufficient number and variety of HHAs to accommodate the sampling design. VNAs constitute a very large proportion of HHAs, a situation that typifies this part of the country.

Medicaid accounts for only about 10 percent of HHA client reimbursements. Massachusetts is the only state of the recommended sample group in which Medicaid plays a significant role in home health services. Furthermore, across the five states, there is a wide range of Medicaid reimbursement policies, a factor which may confound study results. It is recommended, therefore, that the dual Medicare-Medicaid population of HHA clients be excluded from the study sample.

3.1.1 Allocation of Agencies to Treatment and Control Groups

The optimal allocation of agencies to treatment and control cells depends on which particular payment method comparison one is interested in making. An optimal allocation of agencies should maximize the power of each comparison given any fixed number of agencies. Discussions with HCFA have indicated that the demonstration should compare not only each of the two payment methods to the status quo but also the two payment methods to each other. This objective requires an equal number of agencies in each cell.

It is instructive to compare this result to an alternative objective, namely comparisons of each treatment group to the control only. The optimal allocation in this case assigns more agencies to the control group than to each treatment group. Essentially, the equal allocation of agencies to the three payment methods and the control status trades off power on the estimate of <u>any</u> effect (vs. the <u>status quo</u>) to achieve more power on the between-method comparisons.

Stratification

The restriction that no more than 90 agencies be included in the primary demonstration sample imposes limitations on the number of potentially relevant factors which can be controlled for explicitly. Simple random sampling of this small number of participants from the population of home health agencies (as defined in the previous section) almost certainly will result in a sample in which some of those attributes that are known to have significant potential for effects on demonstration outcomes are under-represented. For example, state-specific regulations exert a strong influence on the home health industry. Therefore, one must ensure that each state is represented by enough agencies to permit variation along other relevant dimensions. Simple random sampling will not yield enough agencies from states with comparatively few agencies. Similarly, facility-based voluntary agencies comprise an agency type which we expect will respond differently to payment incentives than will agencies that are either free-standing or proprietary, or both. However, because only about 14 percent of agencies in the sampling universe belong to this category, simple random sampling will produce too few agencies to assign to each treatment and control group within each state.

Therefore, a statistically valid demonstration design requires a sample that is stratified according to the most critically relevant (i.e., potentially confounding) influences on agency behavior. The task of analyzing three payment methods on the basis of a sample no larger than 90 agencies obviously imposes severe restrictions on the number of permissible stratification dimensions.

While home health agencies respond to a great many incentives, the following factors will probably exert the strongest influence on the impacts of change in reimbursement arrangements.

1. State regulations.
2. Ownership of the HHA.
3. Auspice of the HHA.

State regulations are clearly important in creating and maintaining particular incentives and disincentives within the home health industry. Because these regulations differ among states, and because a number of other agency attributes must also be controlled for in the stratification of a relatively small number of agencies, it is imperative that the demonstration be performed in a limited number of states. As was noted previously, the demonstration will include five states only. This number is sufficiently small to permit a second dimension jointly defined by ownership and auspice.

Agency ownership is crucial because one can plausibly expect that proprietary HHAs will respond differently to alternative payment schemes than will voluntary agencies.[1] Therefore the design must ensure that alternative ownership arrangements are represented for each state in the sample.

Agency auspice constitutes the third relevant factor. Opportunities and constraints vary between hospital-based and free-standing agencies with

respect to, for example, patient mix and administrative costs.[2] The stratification design, therefore, should also accommodate the distinction between facility-based and free-standing agencies.

Agency ownership and auspice produce a three-category breakdown:[3]

(1) Free-standing, proprietary agencies.

(2) Free-standing, voluntary and private non-profit agencies.

(3) Facility-based agencies.

This stratification scheme is designed to yield equal allocation of agencies to each state (five states) and ownership/auspice (3 categories) stratum. This sample design implies that six agencies should be selected for each ownership/auspice category within each state. These agencies would then be assigned to either a treatment or control group.

Preliminary recruiting attempts, however, indicate that equal allocation into each stratum may not be feasible. Because of the voluntary nature of agency participation, it is difficult to predict the distribution of attrition which may occur during the recruitment process (that is, whether more of one particular type of agency will refuse participation), so that distribution of the final sample will not be certain in advance. Also, the distribution of ownership/auspice category varies greatly from state to state. There are few proprietary agencies in the northeast, and few voluntary groups in the south; facility-based agencies are relatively scarce in most states. As a result, there may be an inadequate number of agencies to fulfill the equal allocation design. For example, only one facility-based agency may agree to participate in a particular state, making the required allocation of agencies into treatment or control groups impossible.

We will use post-sampling procedures to facilitate the allocation of agencies to treatment-control groups while accommodating these possible

sampling difficulties. For example, we may stratify the free-standing proprietary and non-profit voluntary agencies by state, but aggregate the facility-based agencies across all states, to remedy the potentially small sample of facility-based agencies.

Such approaches, or others which may become apparent, will be considered for application to the actual sample produced from the recruitment process.

3.1.2 Implementation of the Design

Concerns related to the actual implementation of the demonstration argue strongly in favor of limiting the primary demonstration sample catchment area within each state. The need for preparatory meetings with potential agency participants, as well as monitoring and evaluation of agency site visits during the demonstration, make it highly desirable to minimize travel costs. Of course, geographical restrictions should be applied only if they do not threaten to reduce the variation of agencies called for by the design.

Exhibit 3.1 lists the total number of HHAs that were available for selection, by state and by facility type, as recorded in the Medicare Provider Service (POS) file. In some states, particularly Florida and Massachusetts, it may not be possible to secure participation from six agencies of each auspice. Therefore, when necessary, we will substitute agencies across states, but within auspice categories, to fill the empty cells.

Agencies will be randomly assigned to each study group (2 payment methods or control) within each of the three cells within each state.[4]

Exhibit 3.1

National Home Health Agency Prospective Payment Demonstration

Sampling Universe for the Primary Demonstration Sample

State	Facility Type			
	Free-standing Voluntary & Private Non-profit	Free-standing Proprietary	Facility-based	Total
California	57	166	92	315
Florida	54	84	6	144
Illinois	50	80	41	171
Massachusetts	86	21	12	119
Texas	65	168	68	301
TOTAL	312	519	219	1050

Excludes: - government, SNF-based, or rehab-based agencies
- agencies not located in an MSA
- agencies not active before January 1, 1987

Source: Medicare Provider of Service File, March 1987

3.1.3 Limitations and Threats to Internal Validity

While the demonstration design permits comparisons between payment schemes while controlling for some factors which might seriously confound the results, limitations do exist. For example, estimates of payment method effects within each state and stratum is not possible unless one is willing to make assumptions about the nature of random fluctuations across states and strata. This follows from the fact that only two agencies are assigned to each payment method (or the control group) within each state and ownership/auspice category, a severe restriction on the size of the sample of agencies.

The greatest threat to a demonstration project with broadly generalizable results, however, does not arise from the limitations that are implied by the size of the agency sample. Although we recognize these caveats, we believe that the most critical validity issue pertains to the participation of agencies. The design can identify potential agency participants in an appropriately random fashion, but the actual decision to participate lies outside our control.

Home health agencies will be asked to participate in the demonstration by accepting payment for services rendered to Medicare eligibles on the basis of one or another prospective formula, and by providing certain data needed for monitoring and evaluating the demonstration. Both aspects of participation may be viewed as costly or burdensome by the agencies involved. If so, the result may be substantial nonparticipation on the part of home health agencies.

It is impossible to predict *a priori* the net effect on participation of these advantages and disadvantages. One can predict, however, that there will be a significant, and possibly substantial, rate of nonparticipation

among agencies invited to join the demonstration, and that the rate of participation will vary by type of agency.

Differential nonparticipation has serious implications for the validity and generalizability of the results of the demonstration. If high-cost agencies tend to select themselves out of the demonstration, the resulting sample will tend to distort the estimates of the effects of prospective payment.[5] And, if agencies self-select on the basis of their perceived ability to achieve cost reductions, the results are likely to overstate the effects of a similar national policy, since the sample will be biased toward agencies most likely to show larger responses.

Still other changes may introduce so much "noise" into the data that pure demonstration effects will be difficult to detect. All agencies will change fiscal intermediary; more importantly, agencies participating in the demonstration will not be immune to the general turmoil of the industry. Such events as reorganizations, changes in auspice or non-profit status, not to mention spinoffs of satellite corporations may blur the effects of prospective payment.

Again, the net effect of these various biases is impossible to predict in advance. We recommend that the evaluation examine the question of non-participation bias directly, using all available data. We further recommend that the behavior of demonstration agencies be compared to that of a sample of non-demonstration agencies. Chapter 6 of this report discusses this issue further.

Generalizability Concerns

Strictly speaking, the results of the study can only pertain to the five states that are included; the five states were not chosen in a random

fashion. Rather, they were selected with a view to geographical diversity and adequacy of the level and mix of agencies. However, we do believe that results obtained through the demonstration will apply more generally and thus are relevant to national policy. Clearly, if estimates of state effects (given suitable assumptions about the nature of random fluctuations across states) prove to be much smaller than other influences, we will have even greater assurance of generalizability.

3.2 Sample for the Special Rural HHA Substudy

Recognizing that the operating environment of home health agencies in rural areas may cause their responses to the incentives of the prospective payment demonstration to differ systematically from those of agencies in urban areas, we have excluded them from the primary demonstration sample. This was done in an effort to maximize our ability to detect and measure demonstration impacts. As described above, our sample size constraints leave no further room for additional sampling strata. Any additional sources of variance would therefore simply impede the assessment of the demonstration's impacts.

However, the recognition of the fact that the impacts of prospective payment on rural agencies would differ from those on urban agencies suggests that at least some information on these impacts should be included in the body of data which is to form a basis for future policy decisions regarding home health care reimbursement. To address this need, we have incorporated a supplemental sample of 10 rural home health agencies into the demonstration design. These agencies will meet all of the criteria of the primary sample (i.e., government providers and agencies established after January 1, 1987 are excluded) other than location. Ideally, they will all be located in a single state - possibly Texas, which has the largest number of rural providers.[6]

These agencies would operate according to all of the regular demonstration procedures. The only differences would be special site visits and data collection by the evaluation contractor in support of a case study analysis of the experience of the rural agencies in the demonstration.

The 10 rural agencies would be divided between each of the two payment methods and the control group. Even with this sample size, we expect to have the statistical power to detect relatively small demonstration effects (see Exhibit 3.3 below). However, this focus of this substudy is on the qualitative assessment of the differential impacts of the demonstration on rural agencies.

3.3 Detectability of Effects

The ability to observe outcome effects of prospective payment rises with the number of agencies participating in the demonstration. That is, as the number of agencies increases, the size of the minimum detectable effect falls. Exhibits 3.2 and 3.3 display the statistical power to detect outcome effects of various sizes during a three-year demonstration for a sample of 90 urban agencies and for a separate sample of ten rural agencies.

As the tables show, statistical power increases with the share of agency-specific variance in the total variance of any outcome measure. The assumptions used in the construction of the table are:

1. On average, agencies admit 200 patients per year.
2. Outcomes will be measured using a one-sided hypothesis test with five percent significance.
3. A "double difference" estimator will be used. That is, effects will be measured by computing differences between treatment and control groups in the value of a "before and after" difference measure. (A "single difference: estimator produces greater power, but is more susceptible to bias).

Exhibit 3.2

National Home Health Agency Prospective Payment Demonstration

Statistical Power to Detect Effects of Alternative Sizes:
Results for a Three-Year Demonstration
with 90 Urban Sites

Share of Agency Variance in Total Variance	Effect Size		
	0.01σ	0.025σ	0.05σ
0%	0.32	0.90	0.99
20%	0.36	0.95	0.99
50%	0.50	0.99	0.99

Note: The symbol σ refers to the standard deviation of the outcome variable of interest. The variance of the outcome variable, σ^2, is assumed to be composed of an "agency variance", σ_ϕ^2, and a disturbance variance, σ_ε^2. The agency share of total variance is given by σ_ϕ^2/σ^2.

Exhibit 3.3

National Home Health Agency Prospective Payment Demonstration

Statistical Power to Detect Effects of Alternative Sizes:
Results for a Three-Year Demonstration
with 10 Rural Sites

Share of Agency Variance in Total Variance	Effect Size		
	0.025σ	0.05σ	0.1σ
0%	0.23	0.58	0.98
20%	0.27	0.66	0.99
50%	0.36	0.83	0.99

Note: The symbol σ refers to the standard deviation of the outcome variable of interest. The variance of the outcome variable, σ^2, is assumed to be composed of an "agency variance", σ_ϕ^2, and a disturbance variance, σ_ε^2. The agency share of total variance is given by σ_ϕ^2/σ^2.

The reader should be alert to the differences in effect sizes in Exhibits 3.2 and 3.3. The smaller rural sample obviously provides lower power to detect outcomes of a particular size than does the 90-agency urban sample. Therefore, the power calculations for the rural providers are carried out for somewhat larger effect sizes than for urban providers. The largest effect size for which power is reported in Table 3.3, 0.1σ, is still lower than the 0.2σ effect size considered "small" in texts such as Cohen's Statistical Power Analysis for the Social Sciences. Details of the power computations are contained in an appendix to this chapter.

CHAPTER 3 FOOTNOTES

1. United States Comptroller General, General Accounting Office, Home Health Care Services - Tighter Fiscal Controls Needed, HRD-79-17 (Washington, D.C., May 15, 1979).; United States Comptroller General, General Accounting Office, Medicare Home Health Services: A Difficult Program To Control (Washington, D.C., September 25, 1981).

2. On the question of patient mix, see Warren Balinsky and Sabeeha Rehman, "Home Health Care: A Comparative Analysis of Hospital-Based and Community-Based Agency Patients," Home Health Care Services Quarterly, Vol. 5(1), Spring 1984, 45-60.

3. Facility-based, proprietary agencies do exist; however, they constitute only about 0.5 percent of all agencies in this sample.

4. The sampling algorithm is described in C.T. Fan, Marvin E. Muller, and Ivan Rezucha, Journal of American Statistical Association, 1962, 57, 387-402.

5. If the decision to participate is made before the assignment to treatment or control status and specific payment method is known, the result will be an underestimate of the effects. In that case, high-cost agencies will be underrepresented in all cells, including controls, and, on the assumption that prospective payment has larger effects on high-cost agencies, the effects of the demonstration will understate the effects of a mandatory national policy. If, however, assignment is known before the decision to participate is made, one can expect more nonparticipation among high-cost agencies assigned to prospective payment plans than among those assigned to control status. In that case, direct comparison of the costs of treatment and control agencies will overstate the effects of the demonstration.

6. As an alternative to a dichotomous MSA/non-MSA measure of rural location, an accepted methodology for classifying counties on a 11-point scale from urban to rural has been developed by Jerome Pickard of the Appalchian Regional Commission. Using this algorithm, which is based on economic development and location of employment of county residents, the number of HHAs located outside of metropolitan and nonmetropolitan counties or satellite counties (values of 8 to 11 on the scale) was as follows: California, 12; Florida, 9; Illinois, 24; Massachusetts, 3; and Texas, 70.

Appendix to Chapter 3

Derivation of Statistical Power of the Design

Patients are selected into the sample on the basis of a random sample of agencies rather than of individuals. Patients themselves therefore constitute a cluster sample of the population. For this reason, the outcome measure, x, may be regarded as the sum of an agency effect and an independent individual effect. If there are q agencies in the sample and p patients per agency, then the decomposition may be expressed

(1) $x_{ijt} = \mu_t + \phi_i + \epsilon_{ijt}$; $E(\phi_i) = E(\epsilon_{ijt}) = 0$

where x_{ijt} represents the value of the outcome measure x for individual j, at provider i, in period t. (Period here should be understood as a distinguishing time before prospective payment from time after implementation of the demonstration). In equation (1) above, μ_t represents the expected value of the outcome measure, ϕ_i represents the agency effect and ϵ_{ij} represents a random individual effect. The variance of x_{ijt} may (under standard assumptions) be written simply as

(2) $\sigma^2 = \sigma^2_\phi + \sigma^2_\epsilon$.

The variance of the sample mean of cost per patient in the q agencies of a single treatment group can be expressed

(3) $Var(\bar{x}) = Var((1/qp)(\Sigma\Sigma x_{ij})) = (1/qp)^2 \cdot (p^2 q\sigma^2_\phi + pq\sigma^2_\epsilon)$
$= \sigma^2_\phi/q + \sigma^2_\epsilon/pq.$

If the share of agency-specific variance in the total variance of the outcome measure is k $(k = \sigma^2_\phi/\sigma^2 = \sigma^2_\phi/[\sigma^2_\phi + \sigma^2_\epsilon])$ then equation (3) may be rewritten as

(4) $Var(\bar{x}) = \sigma^2 \cdot (k/q + (1-k)/pq).$

The variance of $\bar{x}$ clearly falls as k approaches zero. Consider however the difference in means of the outcome variable across periods (but within a single treatment group).

(5) $\bar{x}_1 - \bar{x}_0 = (1/pq)\Sigma\Sigma x_{ij1} - (1/pq)\Sigma\Sigma x_{ij0}.$

Since the ϕ_i are differenced out and the ϵ_{ijt} have zero mean, the expected valule of $X_1 - X_0$ is simply $\mu_1 - \mu_0$. The variance of $x_1 - x_0$ is

(6) $Var(x1 - x0) = (2/pq)\sigma^2_\phi = (1 - k) \cdot (2\sigma^2/pq).$

The variance of the "double difference" of means between treatment and control groups is

(7) $Var[(x1 - x0) - (x_1 - x_0)] = (1 - k) \cdot (4\sigma^2/pq)$

and so the standard deviation is $\sqrt{(1 - k)} \cdot (2\sigma/\sqrt{pq})$.

The power of the double-difference estimator to detect an outcome of size δ (under normality) is given by

(8) $Pr[z > 1.645 - \delta/\sqrt{(1 - k)} \cdot (2\sigma/\sqrt{pq})]$

where z is a standard normal random variable. For a three-year demonstration, the variance of the double-difference is given by the expression $(1 - k) \cdot (4\sigma^2/9pq)$ and the standard deviation is given by $\sqrt{(1 - k)} \cdot (2\sigma/3\sqrt{pq})$. Therefore after three years the power of the double difference estimator to detect effects of size δ is given by

(9) $Pr[z > 1.645 - \delta/\sqrt{(1 - k)} \cdot (2\sigma/3\sqrt{pq})].$

In the power table, effect sizes have been normalized by the standard deviation of the outcome measure, so that power to detect values of δ/σ of 0.01, 0.025, and 0.05 are displayed.

4.0 IMPLEMENTATION ACTIVITIES

Demonstration implementation activities can be categorized into two major groups: those that occur prior to demonstration startup; and those that occur throughout the 3-year demonstration period. The former category includes agency recruitment, payment rate calculation, provider agreement negotiations, and agency training. The latter includes activities such as program monitoring and technical assistance, quality assurance monitoring, and progress/problem reporting. Data collection activities span the entire implementation period. Exhibit 4.1 shows the schedule for each of the major implementation activities.

4.1 Agency Recruitment

Agency recruitment was initiated in May 1988 with informational group meetings in each of the five demonstration states. The recruitment process has been "on hold" since then, pending resolution of questions relating to various aspects of the demonstration's design. It will be resumed with one-on-one contacts with home health agencies supplemented by regular contacts with national organizations such as the Visiting Nurses Association of America (VNAA), the American Federation of Home Health Agencies (AFHHA) and the National Association of Home Care (NAHC). Meetings will be held with association members to brief them on the demonstration and elicit their support before contacts are made with individual agencies.

The re-contacting of agencies will be followed by individual site visits to agencies that are interested in participating. The following sections discuss, in detail, the stages of agency recruitment.

Exhibit 4.1

National Home Health Agency Prospective Payment Demonstration

Implementation Schedule by Activity

Contact home health agencies through letters and telephone calls.	March 1990
Conduct individual followup visits to answer remaining questions and collect baseline data for rate setting.	March-August 1990
Calculate payment rates for each agency.	April-September 1990
Sign provider agreements.	May-October 1990
Train HHAs on prospective payment methods and reporting requirements.	May-December 1990
Phase in demonstration HHAs.	July 1990-January 1991
Begin quarterly reporting based on FI reports and statistics prepared by HHAs (admissions, discharges, services provided, finances, problems encountered).	October 1990; every quarter thereafter
Quarterly/Annual site visits and record reviews of Medicare patients for quality assurance and casemix adjustments.	Corresponding to HHA start dates; 1991, 1992, 1993
Annual reports to HCFA	September 1991, 1992, 1993
Recalculation of payment rates.	In phases; 1991, 1992, 1993
Phase-out of demonstration.	July 1993-January 1994
Final report.	June 1994

Agency Contact

Resumption of recruitment activities for the primary demonstration sample will begin by sending letters to all agencies who were included in the 1988 recruitment sample. (This includes all agencies identified in the Medicare Provider of Service file as nongovernment, located within SMSAs in the 5 demonstration states, and established prior to January 1, 1987.) Exhibit 3.1 above shows the approximate number of agencies meeting these eligibility criteria.

Each of these agencies will receive an introductory letter from HCFA, that describes the renewed activity on the demonstration and its continued importance, plus an updated project brochure. The letter will be tailored to each agency's most recent status in the recuitment process. For those agencies that declined to participate in 1988, we will acknowledge that fact and present this as an opportunity to reconsider this decision in light of the new information we have to offer (and in light of how their situation may have changed.) To agencies that previously indicated a willingness to participate, we will express appreciation for their continued interest. To take further advantage of the knowledge gained during our 1988 recruitment activities, we will follow the protocols indicated by agencies that are part of chains. In some cases, we were directed to deal with the central office in all matters regarding the demonstration. In others, we have been told to deal with the individual agency, with a courtesy copy of all correspondence to the chair headquarters. We will follow the procedure specified by each organization.

The letter will be followed within a week to ten days by a telephone call from trained AAI interviewers. The purpose of the phone call is to confirm that the mailing reached the agency, to (re)establish contact with the agency director, to determine the current level of interest in participating,

and to offer to send more detailed information on the demonstration's design and procedures.

The rural agency substudy will include agencies that were not involved in demonstration recruitment activities in 1988. All agencies that meet the demonstration criteria and are located in a selected area (as noted above, most probably in Texas) will receive a special letter introducing the demonstration, describing the rural substudy, and inviting them to participate.

Followup Mailing

Agencies that express interest in participation (or a willingness to review further information) will be sent a more detailed summary of the demonstration, ten pages or so that present facts such as:

- o details of the rate-setting process, with examples
- o schedules of payment adjustments (casemix, volume, etc.)
- o tables on risk protection and profit-sharing

as well as an extensive list of "questions and answers," based on questions received at the 1988 group meetings and subsequent meetings with industry representatives. The goal is to provide agencies with the information they need to make a tentative decision on participation. The package will include a short form, analagous to the Registration Form which agency representatives completed at the group meetings. Agencies who are interested in further discussions regarding participation will be asked to complete this form and to return it in an enclosed postage-paid return envelope, including, if possible, a copy of their most recent Medicare Cost Report (MCR). This will allow us to update the data on agency characteristics which we obtained from last year's meetings. Agencies that are not interested in participating will be asked to indicate that on the form and to return it so that we can complete our files.

If agencies are slow in responding to this mailing, we will use telephone reminder calls to determine their status vis-a-vis the demonstration. These will be undertaken in order of fiscal year end-date (based on information from the Provider of Service file) so that the agencies that would start up earliest (e.g. July 1990) get first attention.

Recruitment Site Visits

Based on the responses to the followup mailing, individual site visits will be scheduled with interested HHAs. Individual agency site visits will be conducted from March to August 1990. Interviews will be scheduled with agency administrators and financial staff to answer any remaining questions about the demonstration and to review utilization and financial data and reports. Agencies will also be provided with draft provider agreements for their review. The purpose of this site visit is thus twofold: to provide agency staff with the additional information about the demonstration they need to make a decision regarding participation; and to collect qualitative and quantitative baseline data to assist in payment rate calculations, training, startup and ongoing monitoring, and evaluation. A detailed discussion of the data to be collected during this visit can be found below in Section 4.5.

4.2 Payment Rate Calculation

To assist HHA staff in making an informed decision regarding participation in the demonstration, they will be provided with provisional reimbursement rates for their agency under each payment method. Ideally, these would be provided during the site visit; however, if the information needed is not obtained until the site visit, the rates will be calculated as soon as possible afterward and reported to the agency.

These rates will be calculated using the Medicare Cost Reports (MCRs). They will be provisional, in that more recent data might be used to calculate the rates by the time agencies are actually phasing in to the demonstration, and further adjustments could result from changes to the cost report as it is settled. To avoid self-selection bias, agencies will not be allowed to choose their payment method assignment; they will be randomly assigned to a method (or a control group) once they have agreed to participate.

Payment rates will be calculated according to the procedures described in chapter 5. For the setting of the initial rates, little data is needed beyond what is available on the MCR. Base-year data on patient characteristics, used to construct the casemix index, is not needed until we begin to report data on agency casemix during Year 1.

4.3 Provider Agreement Negotiations

Provider agreement negotiations will begin after the HHAs have been fully briefed on the demonstration, reviewed their payment rates, and have agreed (in principle) to participate. The provider agreement will outline the changes in HHA practice from the current system and establish ground rules for the demonstration period (Exhibit 4.2 shows a draft). A demonstration protocol, describing the demonstration design, details of the payment methods, participation requirements, and a demonstration timetable will be provided with the agreement.

Exhibit 4.2

National Home Health Agency Prospective Payment Demonstration

Draft Provider Agreement

HEALTH CARE BENEFITS FOR THE AGED AND DISABLED

(Agreement with a Medicare Home Health Agency
to Participate in the Medicare Home Health Agency
Prospective Payment Demonstration)

PARTICIPATION AGREEMENT

Between

The Health Care Financing Administration,
U.S. Department of Health and Human Services
(hereinafter referred to as "HCFA"),

and

,

(hereinafter referred to as "the Home Health Agency").

HCFA and the Home Health Agency, for the purpose of conducting a demonstration program under the authority of section 4027 of P.L. 100-203 and section 402 of the Social Security Amendments of 1967 as amended, hereby agree to the following:

Article I. Background

HCFA is implementing the Home Health Agency Prospective Payment Demonstration, hereinafter referred to as "the Demonstration," pursuant to section 4027 of the Omnibus Budget Reconciliation Act of 1987. The purpose of the Demonstration is to test the feasibility of alternative prospective payment methods for home health services under Medicare, and to assess their effects on home health agency costs and operations. HCFA has entered into a contract (HCFA Contract No. 500-84-0021) with Abt Associates for the design and implementation of the Demonstration.

Article II. Assignment to Payment Method

The Home Health Agency, a Medicare approved home health agency, agrees to participate in the Demonstration and abide by the terms and conditions specified in this contract. HCFA will assign the Home Health Agency to one of three payment methods: the per visit prospective payment method, the per episode prospective payment method, or a control group that will continue to be reimbursed in accordance with existing Medicare reimbursement principles.

Article III. Conditions for Reimbursement

A. HCFA shall make payment to the Home Health Agency for Medicare covered home health services provided by the Home Health Agency in accordance with the Reimbursement Methodology for the Demonstration (Appendix A).

B. HCFA shall select an organization to serve as the fiscal intermediary for the Demonstration. The Home Health Agency agrees to utilize the Demonstration fiscal intermediary selected by HCFA for the term of this agreement. Reimbursement, claims review and processing, and cost report settlement functions shall be carried out by the Demonstration fiscal intermediary in accordance with Medicare regulations, rules, and procedures, subject to the provisions of the Reimbursement Methodology. The Home Health Agency shall comply with the procedures specified by the fiscal intermediary for preparation and submission of claims and cost reports. The Home Health Agency agrees to return to its designated regional home health intermediary or alternative designated regional home health intermediary at the end of the demonstration.

Article IV. Approval of Medicare Waivers

A. For the purpose of conducting the Demonstration, HCFA approves waivers (Appendix B) of pertinent provisions of title XVIII of the Social Security Act and implementing regulations. The Home Health Agency shall continue to operate under existing Medicare regulations, rules and procedures pertaining to eligibility for and coverage of home health services under title XVIII of the Social Security Act, and shall be subject to any future changes in regulations, rules, and procedures that are not waived under the Demonstration.

B. For those services, items, and costs (as described in the Reimbursement Methodology) that continue to be reimbursed in accordance with existing Medicare reimbursement principles, the Home Health Agency shall continue to be subject to existing regulations, rules, and procedures pertaining to Medicare reimbursement and shall be subject to any future changes in these regulations, rules, and procedures, that are not waived under the Demonstration.

Article V. Reports, Data, and Examination of Records

A. During the course of this demonstration, the Home Health Agency shall provide information to HCFA, the Demonstration fiscal intermediary, or to contractors designated by HCFA to perform evaluation, quality assurance, or program monitoring functions.

B. HCFA shall have the right to inspect or otherwise evaluate the quality, appropriateness, and timeliness of services performed under this contract.

C. The HHA agrees that HCFA, the Department of Health and Human Services, and the Comptroller General of the United States (including their duly authorized representatives), shall have access to and right to examine any books, documents, papers, and records of the HHA that pertain to any aspect of services performed, reconciliation of benefit liabilities, and determination of amounts payable under this participation agreement.

D. The right to inspect, evaluate and audit will extend through 5 years after the term of this participation agreement or the date of the final settlement for any cost report period, whichever occurs last, unless -

1. HCFA determines there is a special need to retain a particular record or group of records for a longer period and notifies the organization at least 30 days before the normal disposition dates;

2. There has been a termination, dispute, fraud or similar fault by the organization, in which case HCFA may extend the retention requirement to 5 years from the date of any resulting final settlement; or

3. HCFA determines that there is a reasonable possibility of fraud, in which case it may reopen a final settlement at any time.

F. The HHA agrees to cooperate with HCFA or its contractors during site visits, patient record sampling and review, and site interviews with agency staff. In addition, the HHA agrees to cooperate to the best of its ability with future data collection requirements of the organization designated by HCFA to evaluate the demonstration.

G. If the Home Health Agency is assigned to the control group, HCFA shall arrange payment to the Home Health Agency in the amount of $_________ annually during the term of this agreement as compensation for data collection activities.

Article VII. Modification

This participation agreement may be modified at any time, but is subject to written consent of both the Home Health Agency and HCFA.

Article VIII. Term of the Participation Agreement

The Home Health Agency's participation in this demonstration shall be effective for services provided during the period ____________________ through ____________________. If the Home Health Agency ceases to be a Medicare approved home health agency during the term of this participation agreement, this agreement shall be terminated on the date Medicare certification ends. In addition, HCFA may terminate this agreement upon 90 days' written notice if it determines that continuing the waivers would no longer be in the public interest.

Article IX. Appendices

The appendices attached hereto are a part of this contract.
- Appendix A - Reimbursement Methodology
- Appendix B - Waivers of Title XVIII Provisions

In witness whereof, the parties hereby executed this participation agreement this ____________ day of ____________, 1989.

By ____ ________________
(for the Home Health Agency) (Date)

____
(Title)

By ____ ________________
(for the Health Care Financing Administration) (Date)

____
(Title)

10/16/89

4.4 Agency Training and Operating Procedures

Following the signing of a Provider Agreement and prior to startup, each HHA will be trained by AAI, FI, and quality assurance staff on demonstration procedures, forms completion, and reporting requirements. During the training session, agency staff will be fully briefed on the payment methods, the role of the fiscal intermediary, quality assurance and project monitoring activities, the extent of the reporting requirements, and the evaluation of the demonstration. Several training sessions will be held in each area, to avoid a protracted gap between the time that agency staff are trained and the time the agency actually enters the demonstration.

A detailed Operations Manual will be provided to aid HHAs throughout the demonstration. The manual will provide descriptions and timetables for:

- Payment methods and case mix adjustments
- Project information needs and data collection
- Quality assurance monitoring
- Forms completion and reporting
- Site reviews -- purpose, personnel, schedule

AAI staff will periodically revise and update the manual and provide training to new agency staff as required. "Problem resolution forms", presenting questions raised by individual agencies and their resolution, will be produced and distributed to all participating agencies on an ongoing basis to disseminate information on demonstration procedures between formal updates of the manual.

The understandable need of the HHAs to have all significant aspects of their participation, both obligations and rights, spelled out in the provider agreement and/or its accompanying protocol requires that all such issues be finalized before these materials are signed, currently scheduled for May

1990. If there are issues for which this schedule cannot be met (e.g., PRO or FI functions subject to a protracted contracting process), the recruitment schedule will need to be modified accordingly.

4.5 Demonstration Data Collection

Information from home health agencies is needed both prior to demonstration startup and throughout the 3-year implementation period. Qualitative and quantitative data will be collected and used to establish baseline agency profiles, to calculate payment rates, to monitor progress, and for purposes of the evaluation. While information requests will be kept at a minimum, several important data elements not available from existing Medicare files must be collected directly from agencies.

As described earlier, agency-specific data will be collected from HHAs through the recruitment followup mailing and the individual site visits. In addition, data will be collected during site visits and periodically by mail and/or telephone. Exhibit 4.3 outlines the types of data that will be collected during the recruitment and implementation processes.

Recruitment Followup Mailing

Agency-specific information was collected from HHAs that attended the group meetings in 1989. As mentioned earlier, these data will be updated by mail contact with all agencies that are interested in participating in the demonstration. Baseline information will thus be available on agencies that express interest but decide not to participate or are subsequently determined ineligible in addition to those that do participate. Data related to the following topic areas will be included in this data base:

Exhibit 4.3

National Home Health Agency Prospective Payment Demonstration

Type and Schedule of Demonstration Data Collection from HHAs

	During Recruitment and Development	During Implementation
Collection by mail:	Followup Mailing	HHA Submissions, by Mail
	HHA Characteristics HHA Statistics Medicare caseload Organization Billings by Payor	Recent Medicare Cost Report Financial Statements Statistical Reports QA Procedures
		Mail/Telephone Surveys
		Organization Operations Services Referrals Patients
Ongoing submission:		Patient intake forms
Collection on site:	Recruitment Site Visits	Site Visits
	Organization Operations Services Referrals Patients Recent Medicare Cost Report Financial Statements Statistical Reports QA Procedures Agency Forms	Organization Operations Services Referrals Patients Patient records QA interviews

- basic organizational data (ownership category, age, services provided, etc.) to verify sampling assumptions based on HCFA's Provider of Service file;

- presence of electronic billing systems;

- agency statistics (volume of visits, payor mix, Medicare performance);

- identity of fiscal intermediary;

- anticipated organizational changes.

Individual Site Visits

Recruitment site visits to interested agencies will be an opportunity to update baseline information and to collect copies of HHA patient intake forms, care plans, service records, statistical reports, financial reports and the most recent Medicare Cost Report. A sample interview guide for these visits is presented as Exhibit 4.4; a sample list of the possible reports and forms to be collected during these visits is outlined in Exhibit 4.5.

Ongoing Data Collection

Throughout the demonstration, data will be collected to support the monitoring of demonstration operations and reporting to HCFA. This data collection will be accomplished during site visits, over the telephone, and periodically by mail, as listed in Exhibit 4.3. Requests will be made for updates to agency baseline data, most recent Medicare Cost Reports, financial statements, and data related to case mix and services. For quality assurance monitoring, regular visits may be made to participating agencies to collect the necessary information.

Routine telephone and site visit monitoring will permit AAI to keep abreast of HHA progress and problems and will provide input into the periodic reports to HCFA. It is not planned that every demonstration HHA will receive a site visit every year. A sample will be visited each year, and all will be

Exhibit 4.4

National Home Health Agency Prospective Payment Demonstration

Site Visit Guide

Agency Name: ______________________ Provider No. ______________

I. GENERAL ADMINISTRATION

Name and Title of Respondent ______________________________

____

A. ORGANIZATION

1. Type of agency:

Freestanding Voluntary	___
Freestanding Proprietary	___
Freestanding Nonprofit	___
Facility-Based Nonprofit	___
Facility-Based Proprietary	___

2. Ownership:

a) Single agency ___

b) Part of chain (name:) ______________________________

- Location of central office ______________________
- Relation to central office:
  Franchise ___ Directly owned by parent company ___
- Locus of control for activities:

	Same as Central Office	Uses Own
Fiscal intermediary	___	___
Admin. policies, procedures	___	___
Billing	___	___
Cost report preparation	___	___
Data processing	___	___
QA procedures	___	___
Planning and marketing	___	___
Treatment guidelines	___	___

3. Date of incorporation: ______________

Date of Medicare certification: ______________

2. Do you plan to change your current practices regarding provision of medical supplies and equipment? N___ Y___ Why?

___

___

Regarding services? N___ Y___ Why? ___

___

3. Any organizational changes anticipated (e.g., merger, reorganization? N___ Y___ What type? ___

4. Plans to automate agency data or purchase computer services? N___ Y___ How? ___

5. Plans to change marketing strategy (e.g., relations with hospitals)? N___ Y___ How? ___

D. ENVIRONMENT

1. What defines the agency's service area? ___

___

2. What is the approximate service area population? ___

What is the service area population over 65? ___

3. How many other HHAs are operating in the service area? ___

What is the approximate distribution by ownership type?

	Percent of Agencies	Percent of Medicare Visits Provided
Freestanding Voluntary	___%	___%
Freestanding Nonprofit	___%	___%
Freestanding Proprietary	___%	___%
Facility-Based Nonprofit	___%	___%
Facility-Based Proprietary	___%	___%
	100%	100%

4. Has the number of HHAs in the service area changed in past 5 years?

No ___ Increased ___ Decreased ___

What types of agencies have changed? ___

___

5. Is competition a problem for this agency? Y_ N___

4. Hospice certifcation? Y___ N___

5. Part B provider of outpatient services? Y___ N___

B. OPERATIONS

1. Agency size (past year)
   Unduplicated patient count: ______
   (Include all patients, not just Medicare)

2. Services provided:

	Direct	Under Contract
Skilled nursing	___	___
Physical therapy	___	___
Speech therapy	___	___
Occupational therapy	___	___
Medical social services	___	___
Home health aide	___	___
Other: ______________	___	___
______________	___	___
______________	___	___
______________	___	___

3. Durable medical equipment:
   Provide directly ___
   Sell ____ Rent ____
   Contract with independent supplier ___
   No dealings with DME ___

4. Current Waiver of Liability status: ______________

   Date of last change: ______________

5. Automated data processing:
   Payroll ___
   Billing ___
   Patient records ______________ (types)

   Is data entry performed on site? Y___ N___
   Is data processing operated on site? Y___ N___
   If internal system is purchased, what system? ______________
   Plan to replace within next 3 years? Y___ N___
   If data services are purchased, what company? ______________

C. DEVELOPMENT PLANS

1. What specific areas of service or volume changes are anticipated?

____

____

6. Have any local hospitals undergone financial and/or service changes that affect the agency? No ___ Yes ___ Please describe:

____

____

Are any anticipated? ______________________________

7. Does the HHA have formal referral arrangements with hospitals or nursing homes? N___ Y___ Describe them: ____________

____

____

Has this changed recently? No ___ Yes ___ How? ________

____

Are any changes anticipated? No ___ Yes ___ How? ________

____

II. FINANCE

Name and Title of Respondent ______________________________

____

1. Agency payor mix last year:

Payor	% of Revenues	Average Monthly Billings
Medicare	_______	$_______
Medicaid	_______	$_______
Blue Cross	_______	$_______
Commercial insurance	_______	$_______
Self-pay	_______	$_______
Title XX	_______	$_______
Uncompensated care	_______	$_______
Other	_______	$_______
TOTAL	100%	$_______

2. Fiscal-year end date: ____________________

3. Has the agency realized a surplus (profit) or loss in each of the past three years?

Year	Profit	Break Even	Loss
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____

4. Current accounts receivable for:

   30 days $______ 90 days $______

   60 days $______ 120 days $______ >120 days $______

5. Name of current Fiscal Intermediary: ____________________________.

   Since: ________________ (Date)

6. Has the agency used PIP for Medicare reimbursement?

   Y___ N___

7. Claims denial rate in most recent quarter: ______________

8. Date of last settled cost report: __________________

9. What are the cost areas that are least sensitive to volume changes (fixed cost)? ____________________________________

10. What are the cost areas that are hardest to control?

    ____

III. PERSONNEL:

Name and Title of Respondent ____________________________________

____ ____________

	Service	Administration
1. How many full-time employees:	_____	_____
How many part-time employees:	_____	_____
Total FTEs (based on 35 hours/week):	_____	_____

2. Has the size of staff changed significantly in the past three years?

   Number of staff-- Increased ______ Decreased ______

   Number of FTEs -- Increased ______ Decreased ______

3. Is staff turnover: High ___ Moderate ___ Low ___ Seasonal ___

   Which staff type has the highest turnover? ____________________

   ____

4. What governs your decision about whether to employ directly or contract for staff? (E.g., finances, sporadic or small-scale need, availability of personnel) ______________________________

   ____

5. How are work assignments made in the agency? Who makes them? (E.g., who maintains schedules, checks workloads, etc.?)

   ____

6. Who determines therapists' assignments? (E.g., nurse, therapist)

   ____

   Who determines the frequency of therapy visits? ______________

   ____

IV. PATIENT SERVICES

Name and Title of Repondent ______________________________

____

A. REFERRALS

1. Over the past year, approximately what percentage of total and Medicare referrals came from:

	All Referrals	Medicare Referrals
Hospitals - inpatient	____%	____%
Hospitals - outpatient	____%	____%
Physicians	____%	____%
Nursing homes	____%	____%
Self referral/family/friends	____%	____%
Referred by other	____%	____%
Other ____________	____%	____%
TOTAL	100%	100%

2. Do you maintain liaison with hospital discharge planners?

   In one hospital ____ In more than one hospital ____

3. Do most of your hospital referrals come from a single hospital?

   N___ Y___ Which one? ______________________________

4. Have your major sources of referral changed?

   In the past year? N___ Y___ In the past 3 years? N___ Y___

   Nature of change: ______________________________

B. ADMISSIONS

1. Describe patient intake procedures, including how admission decisions are made and how referrals are made to other agencies.

   ____

   ____

2. Approximately what percentage of patients referred to your agency are admitted? __________%

3. For referrals that were not admitted over the past year, what were the principal reasons?

	Percent of Referrals Not Admitted
Service not available in agency	____
Service needs too intensive	____
Skilled care not needed	____
No source of payment	____
Other ____________	____
____________	____
____________	____
TOTAL	100%

4. Does your agency refer these patients elsewhere? N ___ Y ___ .

Where most frequently? ________________

What is the procedure for this? ________________

____

C. PATIENTS

1. At this time, what are the five most frequent diagnoses of patients treated by your agency (and the proportion of each in your case-load)?

Diagnosis	Percent of all patients	Percent of Medicare cases
________	____	____
________	____	____
________	____	____
________	____	____
________	____	____

2. Have these changed over the past year? N___ Y___ How? ________

____

3. Over the past year, have service needs of patients changed in any of the following ways:

	No	Yes
More acutely ill	___	___
Higher skill level required	___	___
More equipment needed	___	___
More sophisticated technology needed	___	___
More therapies needed	___	___
Other ______________________	___	___

4. Approximately what is the average length of stay for:

   Medicare patients? _______ days   Other patients _______ days

D. SERVICES

1. Who develops the plan of treatment? ______________________________
   (may differ from who signs it)

   Is this different for Medicare vs. non-Medicare patients? N___ Y___

   How? ____

2. Do you use standard criteria for developing the plan? (e.g., number of visits for a given diagnosis) N___ Y___

   Who develops these guidelines? ______________________________

   Have they changed over the past year? N___ Y___ How? ____________

   ____

3. If the patient needs a service not provided by your agency, how is this service obtained? ______________________________

   ____

   What types of services are these, most frequently? ______________

   ____

4. Who makes the determination of when to discharge a patient? ________

   ____

   Are standard criteria used? N___ Y___ What is an example? _______

   ____

E. QUALITY ASSURANCE/UTILIZATION REVIEW

1. Who develops quality assurance procedures? ____________

2. What are the main procedures for quality assurance? ____________

____

(If HHA is part of chain) Does central office handle this? ____

3. Do you contract for outside consultation and quality review? N___

Y___ With whom? ____________

4. Are there specific control mechanisms for protecting against over-serving or under-serving? N___ Y___ Describe ____________

____

5. Have there been any important policy changes in the past year regarding frequency or duration of services? N___ Y___

What precipitated this change? ____________

Are any planned? N___ Y___

6. What impact do fiscal intermediaries have on the type, frequency, and duration of services provided?

____

____

7. How are supplies and equipment monitored and controlled? Who is responsible for this? ____________

____

Exhibit 4.5

National Home Health Agency Prospective Payment Demonstration

Recruitment Site Visit Data Collection

Statistical, Financial, Monitoring Data

- Annual Program Evaluations (required by Medicare) for past 2 years (HHA compiles statistics)

- Waiver information
  1) Status - on or off
  2) Denial rate for past quarter
  3) Copy of most recent waiver of liability determination letter from the FI

- Cost report - most recently filed; most recently settled.

- QA Audit Reports, if any (done by FI for new HHAs and agencies with high rate of denials)

- Statistical summaries and reports compiled by the HHA, most recent.

  -- Include unduplicated patient count (one person per year regardless of number of discharges)

- Agency guidelines for evaluating service needs

Copies of all forms (blank forms and a completed sample with names/IDs masked)

- Patient summary log (at admission)
- Physician plan of treatment
- Patient assessment form
- Plan of care (nursing plan)
- Patient classification forms (if a system is used)
- Admission forms
- Discharge forms

Automated Data

- What data, if any, are kept in ADP form?
- All forms used (admission, patient assessment, nursing plan, QA, etc.)
- Statistical summaries produced in most recent (baseline) period

visited at least once during the demonstration. To provide comprehensive statistics for the annual reports, agencies that are not visited in a given year will be asked to supply some information by mail and telephone. A subset of the quantitative items on the Site Visit Protocol (Exhibit 4.4) may be instituted as an annual reporting requirement, while some of the open-ended items could form the basis for structured telephone discussions with HHA staff. This approach will provide a sound body of data on demonstration operations in an efficient manner.

A more detailed description of reports and technical assistance activities can be found below in Section 4.7.

4.6 Quality Assurance Activities

Quality assurance monitoring activities will be designed to accomplish two goals: to assure that patients served by the demonstration agencies are not adversely affected or denied services as a result of the demonstration; and to provide the evaluation with data on quality of care and appropriateness of service. A natural tension exists between the dual goals of regulating quality and assuring that it is not lowered; and the need to adopt a hands-off, evaluation research posture in order to test the incentives created by the payment methods. Recognizing the conflict does not resolve it, but our approach to quality monitoring must attempt to minimize it.

At this time, the details of the quality assurance protocol have not been completely finalized, though it is known that the existing Peer Review Organizations (PROs) in the five demonstration sites will be responsible for this activity. Staff of the PROs will be responsible for patient level review of quality and appropriateness of care provided under the demonstration, which they will accomplish by review of patient records and other available data.

AAI, through its site visits and other ongoing data collection, will collect information on the structural aspects of agency quality assurance and any changes over time (e.g., internal QA procedures, QA and other staffing, process, outcomes, etc.) and provide these data to the PROs and to the evaluator.

4.7 Reports and Technical Assistance

To provide for optimal information flow among AAI, the HHAs, HCFA, and the evaluator, a series of regular reports, meetings, and technical assistance activities will be implemented. In terms of monitoring demonstration activities, monthly administrative progress reports, quarterly reports, annual reports, and a final project report will be submitted to HCFA by AAI.

To assure consistent implementation of demonstration procedures and to provide HHA staff with timely support, AAI will make regular telephone contact and conduct HHA site visits as necessary. The sections below describe the purpose of these technical assistance and reporting activities in more detail.

Technical Assistance

AAI staff will be available to provide technical assistance to participating HHAs throughout the demonstration period. Site liaisons will be appointed to monitor HHA progress and respond to problems as they arise. Regular telephone contact will be maintained and telephone conversation logs will be kept and disseminated among project staff to ensure that the appropriate persons are informed about any problems that arise that need attention. All problems encountered and their resolutions will be documented on Problem Resolution Forms and disseminated to participating HHAs for informational purposes. As noted above, the demonstration Operations Manual

will be revised and updated on a regular basis. As a supplement to telephone contact, technical assistance site visits (in addition to, or in conjunction with, the monitoring site visits) will be conducted on an as-needed basis.

Quarterly Reports

Quarterly reports related to HHA progress, problems, and services delivered will be prepared for HCFA. Data for these reports can be obtained from HHAs in the form of patient-level data (intake forms) submitted as well as statistical reports prepared by participating agencies. Alternatively, the FI (which would be processing 485/486 forms) could probably generate statistics. To keep the administrative burden on HHAs at a minimum, it would be preferable to use existing reports or demonstration data already being collected as data sources for the quarterly reports.

A proposed outline for these reports is shown as Exhibit 4.6. The reports will be organized in two parts: statistical summaries as shown in Exhibit 4.7 (numbers of admissions and discharges, services provided, etc.) and a narrative on progress and problems encountered during the quarter. The demonstration contractor will coordinate the production of these reports. However, given the division of responsibility for the various demonstration functions, it is clear that all of the organizations involved will have contributions to make to these reports.

Annual Demonstration Reports

Annual reports will be written based on demonstration statistics as well as qualitative data collected from agency staff during site visits or via mail or telephone. The reports will focus on the status of implementation, as well as interim findings such as observed changes in organizational structure,

Exhibit 4.6

National Home Health Agency Prospective Payment Demonstration

Draft Outline for Quarterly Status Reports

I. Quarterly Statistical Summary of the Demonstration (see Exhibit 4.7)

II. Demonstration Activities During the Quarter

  A. Rate Setting/Rate Adjustment Activities

  B. Quality Assurance Monitoring Activities

  C. Data Collection

  D. Other

III. Special Problems During the Quarter

  A. Intermediary Operations

  B. Agency Contractual/Participation Concerns

  C. HHA Reporting Problems

  D. Other

IV. Priorities for the Next Quarter

Exhibit 4.7

National Home Health Agency Prospective Payment Demonstration
Draft Format for Quarterly Statistical Reports

For the Quarter Ending____________

Site	Medicare Admissions		Medicare Visits		Estimated Payments	
	This Quarter	Demo Cumula-tive	This Quarter	Demo Cumula-tive	This Quarter	Demo Cumula-tive
California						
Per-episode agencies						
Per-visit agencies						
Controls						
Florida						
Per-episode agencies						
Per-visit agencies						
Controls						
Illinois						
Per-episode agencies						
Per-visit agencies						
Controls						
Massachusetts						
Per-episode agencies						
Per-visit agencies						
Controls						
Texas						
Per-episode agencies						
Per-visit agencies						
Controls						
Total - PRIMARY DEMO SAMPLE						
Per-episode agencies						
Per-visit agencies						
Controls						
Rural substudy						
Per-episode agencies						
Per-visit agencies						
Controls						
TOTAL DEMONSTRATION AGENCIES						
Per-episode agencies						
Per-visit agencies						
Controls						

Other potential breakdowns (depending on data availability):

- patient demographics (based on 485/486 and intake form data)
- distribution of visits provided by type (based on submitted claims)
- distribution of per-episode admissions by casemix category (based on 485/486 and intake form data)
- percent of visits paid on an outlier basis at per-episode agencies (based on submitted claims)

agency policies, practice and service procedures, and agency perspectives on how the demonstration is progressing, including any problems being encountered. Results of the quality assurance monitoring activities will also be included in these reports.

Final Demonstration Report

Upon completion of the demonstration, AAI will submit a final report to HCFA summarizing both the design and implementation phases of the project. An important part of this report will be selected case studies of home health agency experiences, including problems encountered, changes in agency behavior, and operations under the demonstration. Data collected for annual and quarterly reports will be used to describe case mix, services provided, agency characteristics, etc. Results of quality assurance monitoring will also be analyzed and problems identified. In general, findings with the most relevance to any implementation of a prospective payment program will be emphasized.

4.8 Role of the Demonstration Fiscal Intermediary

A single demonstration fiscal intermediary (FI) will be selected by HCFA to serve all study agencies. The demonstration FI will continue to review and process claims, reimburse providers, audit and settle the Medicare cost reports (as needed), apply medical necessity and utilization guidelines to bills from the demonstration agencies, and pay or deny claims based on these guidelines.

While the major responsibilities of the intermediary will remain unchanged, some modifications in internal processing procedures will be required to accommodate the special procedures and information needs of the

demonstration. In designing the demonstration, we have attempted, wherever possible, not to alter existing intermediary activities. This approach was taken to avoid the potential for changing provider behavior by these modifications and to minimize the amount of disruption to the intermediary.

AAI staff will work closely with the intermediary to analyze reporting needs, data processing requirements, and revisions in operating procedures. Staff from both organizations will develop provider manuals and train the HHAs in procedures to be followed during the demonstration.

Provider Payments

Provider payment procedures will be maintained unchanged to the extent possible. Agencies currently on PIP (periodic interim payments) will remain on PIP for the demonstration. Non-PIP per-episode agencies will most probably receive the payment for each episode in several installments, based, perhaps, on the average length of an episode (two to three months) and distribution of visits within episodes. Non-PIP per-visit agencies will be paid based on submitted claims.

Agencies with waiver of liability will retain that status on entering the demonstration. For per-episode agencies, where individual visits during the initial 120 days of care will not be reviewed or denied, waiver of liability will be calculated separately for the two "segments" of care to be delivered. For visits during the 120-day "episode", waiver of liability will be accorded based on a percentage of episodes denied, rather than a percentage of visits. For all "outlier visits" (delivered beyond 120 days), waiver status will be based on the percentage of outlier visits denied.

5.0 SETTING DEMONSTRATION PAYMENT RATES

This chapter focuses on the general considerations of rate-setting, and the specific procedures that will be used to set payment rates from home health agenices participating in the prospective payment demonstration. The first section of the chapter prese-ts short general discussions of how a variety of issues will be handled under the demonstration. The rest of the chapter presents step-by-step descriptions of the rate-setting process under the two payment methods that will be implemented.

5.1 General Issues in Rate Setting

Provisional and Final Rates

Prospective rates will be computed on the basis of the each agency's Medicare Cost Report for FY 1990. This is considered to be the base period. Since agencies will be enrolling in the demonstration during FY 1990, this cost report will not be available at that point. Consequently, it will be necessary to set provisional rates and revise these when FY 1990 data become available. This problem is common in hospital rate-setting programs.

Provisional rates will be set using the most recent filed cost report. Agencies will be required to decide whether or not to participate on the basis of these rates. Final rates will be determined when the base year MCR is audited and settled.

This situation will understandably raise anxiety of providers who must decide whether or not to participate without knowing the final rates they actually will confront. It emphasizes the need to make the rate setting methodology as simple and straightforward as possible and to emphasize the 'budget-neutrality' of all rates.

Cost Limits

No agency participating in the demonstration will be paid in excess of the Section 223 cost limits. The methods for computing payment rates and adjustments must therefore be modified for agencies that exceed the limits in effect at the inception of the demonstration. For these agencies, costs in excess of the limits will be removed before computing payment rates. The rate computation examples in Section 5.2 illustrate the method for imposing the cost limits on the prospective rates. Should the Section 223 limits change over the course of the demonstration, rates will be recomputed to reflect the new limits. Base year costs will be inflated to the time of the change in limits using the HCFA Market Basket Index and new rates will be calculated for those agencies exceeding the new limits. Should the Section 223 limits for the base year ever be adjusted retroactively, all rates for affected agencies will be recomputed accordingly. No other comparison to the cost limits will be made during the course of the demonstration (other than in calculation of any agency losses and HCFA's obligation under the loss-protection provisions of the demonstration.)

Volume Adjustment for the Per-Visit Method

Agencies experiencing significant increases or decreases in volume during the demonstration are expected to experience the effects of economies of scale due to the spreading of overhead costs over a larger or smaller volume of visits. For this reason, payment rates for all visits rendered by an agency assigned to the per-visit method will be adjusted up by one percent for each ten percentage point decrease in visits. Payment rates will be adjusted down by one percent for each ten percent increase in visits over the course of the demonstration. This process is described in further detail in Section 5.2.

Profit and Loss Sharing

The Medicare program will share the risks of participating in the demonstration for agencies assigned to both payment methods. This will protect agencies from significant losses due to large increases in cost which are beyond their control (e.g., a legislated increase in the minimum wage) and beyond the increase reflected in the HCFA Market Basket. For the per-episode agencies, this feature offers protection against changes in Medicare coverage which might reduce the validity of rates calculated from the HHA's experiences in the base year. By reducing (though not eliminating) the risks of participation in the demonstration, we facilitate recruiting and reduce the potential for self-selection bias.

Losses will be limited to five percent of Medicare-reimbursable costs. At final settlement of each agency's cost report, HCFA will reimburse the agency for losses in excess of five percent of Medicare-reimbursable cost of services provided under prospective payment, up to the Section 223 limits. Agencies are at risk for all losses in excess of the limits.

Medicare will also share in the profits of agencies that earn revenues in excess of cost. All profits of five percent or less of Medicare-reimbursable costs incurred in providing services under prospective payment will be retained by the agency. The Medicare program will receive 25 percent of all profits above five percent and less than 15 percent of cost, and 50 percent of all such profits between 15 and an upper bound. All profits in excess of the upper bound percentage of Medicare-reimbursable costs (of prospectively-paid services) will revert to the Medicare Trust Fund. Currently, the upper bound would be set at 20% for the first operational year of the demonstration, rising to 25% in year 2 and 30% in the third year of the demonstration.

Casemix Adjustment

Agencies assigned to the per-episode payment method are at greater risk for the care needs of their patients than are agencies assigned to the per-visit payment method or agencies assigned to the control group. Because the fixed per-episode payment does not vary with the number of visits rendered, providers might reasonably worry about the financial consequences of admitting too many high-care patients.

Actually, the risk is not so great as it initially appears. First, because budget-neutral rates are set on the basis of each agency's own experience, agencies are not really at risk for their casemix, but rather for changes in their casemix between the base year used to set rates and the years of the demonstration. Second, the five percent limitation on loss further reduces agency risk.

In spite of these risk-reducing features of the per-episode method, a casemix adjustment will be performed for this payment method in order to insure that providers can admit high-care patients without fear of financial penalty.

For this demonstration, we have chosen to build upon previous work by William Foley, Donald Schneider and others by using the Resource Utilization Groups for Home Health Care (RUG-HHC) classification system as the basis for casemix measurement. Extensive analyses of available data on approximately 4,000 patients from Forms 485 and 486 and from the Medicare 40 Percent HHA Claim Files, has failed to produce a reasonable classification scheme that improves upon the RUG-HHC system in capturing variation in resource utilization.

The RUG-HHC system must be modified somewhat since extensive information on Activities of Daily Living (ADLs) and Instrumental Activities of Daily

Living (IADLs) cannot be obtained within the constraints of the brief intake form promised to the providers. Such information will be unavailable for the base year in any event.

The original RUG-HHC system consists of six hierarchical categories which are then further subdivided on the basis of ADL and IADL scores to produce a total of 27 patient categories. The first casemix system devised for the demonstration reproduced the six major categories of the RUG-HHC system as closely as possible, based on the patient descriptions contained on Forms 485/486. Three categories were further subdivided by diagnosis and nursing procedure codes, resulting in a total of eleven categories. These categories were further refined in consultation with Professor Foley, resulting in a patient classification system composed of eight hierarchical groups as shown in Exhibit 5.1. The ability of a classification system to capture variation in resource use is generally measured by the proportion of variance "explained" by the groups. Explained variance is taken to be equal to the ratio of the "between-group" sum of squares to the total sum of squares when the patient categories are used as partitioning groups in a one-way analysis of variance. The closer this "variance explanation" is to one, the greater is the explanatory power of the classification system and the more accurately will casemix changes be recorded in adjustments to payment rates.

The benchmark for variance explanation is the 25 percent achieved by the RUG-HHC system for Medicare home health recipients in New York state. When provider-specific variation is included (which is appropriate, given that all adjustments to be made will be based on provider-specific changes in casemix), the eight-category system proposed here explains just over 21 percent.

Exhibit 5.1

National Home Health Agency Prospective Payment Demonstration

Casemix Groups

REHAB (More than 8 therapy [PT, ST, or OT] visits in first 30 days of episode)

1. CVA within past 6 weeks
2. All other REHAB

SPECIAL CARE

3. IV Fluids (may be parenteral fluids or IV med admin), quadriplegia, comatose, Wound care with cleaning, irrigation, soaking, packing or debridement; Decubitus ulcer level 3 or 4.
4. Dialysis, paralysis, catheter insertion/care, nasogastric feeding

SKILLED NURSING CARE

5. Tracheostomy care (with ventilator), Wound assessment/dressing change; Decubitus ulcer level 1 or 2.
6. Skilled nursing care with CVA, malig. neoplasm, tracheostomy care without ventilator.
7. Medication admin and teaching, nurse monitoring, other ostomy care, range of motion exercises (teaching).
8. All other patients.

The casemix scheme is loosely based on the RUGS-HHC system and is designed to be hierarchical: That is, the first category into which a patient can be classified is selected as the patient's casemix group.

Section 5.2 discusses procedures for using these eight groups to make the retrospective casemix adjustment to payment rates.

Counting Admissions in the Base Year

Setting the per-episode rate requires an accurate count of the number of patient episodes during the base year. The rate-setting method will use the Unduplicated Census Count from Worksheet S-1 of the Medicare Cost Report as the best available measure of this quantity. This count is subject to verification based on the number of distinct Medicare beneficiaries represented in claims filed by the agency in the base year.

Fiscal Intermediary

A fiscal intermediary will be selected by HCFA for the demonstration. This intermediary will determine medical necessity, enter data from the 485/486 forms, audit and settle cost reports, and authorize payment for covered services to Medicare beneficiaries.

The intermediary will issue detailed instructions to providers describing procedures for claims submission either through service bureaus or by online electronic transmission. Procedures for appeals and reopenings of initial or revised determinations will also be issued.

Claims Review

Current Medicare reimbursement policy provides for various reviews of claims and other patient records of agencies. These reviews of eligibility and medical necessity bear directly on reimbursement levels for services provided to Medicare beneficiaries. For purposes of the demonstration, most of these practices will continue. The main exception is that individual visit

review of patterns of care will not be conducted for the agencies assigned to the per-episode method. They will be allowed to alter their mix of visit types, providing for example, more aide visits and fewer skilled visits. Quality of care review by the PROs will assure that patient care is not adversely affected.

Impact of the Balanced Budget and Emergency Deficit Control Act of 1985

It is possible that so-called "Gramm-Rudman cuts" will be triggered during the course of the demonstration if budget reconciliation bills meeting the Gramm-Rudman targets are not signed into law October 15 of any year. Should this occur, payment rates to demonstration providers will be cut by the same proportion as payments to other Medicare providers. These cuts will reduce payment amounts for the period in which the sequestration is in effect, but will not alter the underlying payment rate. For example, if a Gramm-Rudman sequestration is in effect during the time in which an agency's casemix adjustment is made, the adjustment is based on the rate exclusive of any payment reduction. If a percentage reduction remains in force after recomputation of rates, it will apply to the new rate.

5.2 The Process of Rate Setting

Prospective rates will be calculated by the Division of Research and Demonstrations Systems Support (DRDSS) of the HCFA Office of Research and Demonstrations on the basis of the HHA Medicare Cost Report. All rates are provisional and subject to upward or downward adjustment based on final settlement of the cost report. The detailed logistics of the process by which rates are computed and implemented will be specified by DRDSS, but the general approach is as follows:

Computation of Rates I: The Per-Visit Method

Under the per-visit method, a schedule of visit rates is set for each agency -- one for each of the six visit types reimbursable under the Medicare Home Health benefit. Base period cost attributable to each discipline will be computed to arrive at six visit rates for each agency.

1. Computation of Per Visit Payments

For agencies operating below the Section 223 cost limits, payment rates for the demonstration will be set equal to average cost per visit from Worksheet C (Part I, column 4) of the agency's Medicare Cost Report. These amounts will be adjusted for inflation, using the HCFA Market Basket Index, to compute per-visit payment rates for the first year of the demonstration. These rates will be adjusted for inflation in each year of the demonstration using the Market Basket Index.

2. Application of the Section 223 Cost Limits

No agency participating in the demonstration will be paid in excess of the Section 223 cost limits. The methods for computing payment rates and pass-throughs must therefore be modified for agencies that exceed the limits in effect at the inception of the demonstration. For these agencies, costs in excess of the limits will be excluded before payment rates are calculated.

3. Volume Adjustment

If an agency's Medicare visit volume during any year of the demonstration falls below 90 percent of its Medicare volume in the base year, all per-visit rates will be raised by one percent. If volume falls below 80 percent of its level in the base year, per-visit rates will be raised by two percent. This process of one percent increments in each payment rate for every ten percentage point reduction in volume below the level of the previous year continues until the agency reaches half its base-year Medicare visit volume. No further increments to payment rates will be made beyond this point.

In similar fashion, rates for agencies that provide in excess of 110 percent of their base-year visits will be reduced by one percent. Each additional ten percent rise in visits over the base year will result in a one percent reduction in rates up to a maximum reduction of five percent.

This adjustment is retrospective in nature; it will be performed when visit volume for the year is known. Reimbursement for the previous year will be adjusted, and a revised rate will be set for the (then) current demonstration year. This comparison and adjustment will be made following the end of each demonstration year.

4. Per-Visit Rate Computation Example

Exhibit 5.2 shows amounts from Parts I and II of Worksheet C of the base year cost report for a hypothetical agency. These data will be used to illustrate the computation of per-visit and per-episode rates.

Exhibit 5.2

National Home Health Agency Prospective Payment Demonstration

Selected Information From the Medicare Cost Report
of a Hypothetical Home Health Agency

	Total Visits	Cost per Visit	Cost Limits
Skilled Nursing	1500	$51.80	$52.91
Physical Therapy	650	55.02	50.48
Occupational Therapy	540	55.29	56.36
Speech Pathology	150	58.96	59.86
Med. Social Services	60	64.44	66.59
Home Health Aide	1450	33.60	34.27
TOTAL MEDICARE COST		$204,750	

Unduplicated Census Count: 239
Aggregate Section 223 Cost Limit for Agency: $205,277
(Sum of limits times visits)

Sources:

Total Visits: Worksheet S-1, Part I
Variable Cost: Worksheet C, Part I
Cost Limits: Worksheet C, Part II
Undup. Census Ct: Worksheet S-1, Part I

Visit rates are taken directly from average cost per visit as displayed on Worksheet C. These rates are shown below:

	Rate
Skilled Nursing	$51.80
Physical Therapy	55.02
Occupational Therapy	55.29
Speech Pathology	58.96
Med. Social Service	64.44
Home Health Aide	33.60

Notice that the payment rate for physical therapy exceeds the cost limit as shown in Exhibit 5.2. This payment rate is permitted because total Medicare cost of $204,750 does not exceed the aggregate limit of $205,277. If total Medicare cost does exceed the cost limits, all rates will be decreased proportionally as necessary to bring the total of visits times rates equal to the limits.[1]

The per-visit rates are then multiplied by the appropriate HCFA Market Basket inflation factor to arrive at per-visit rates to be in effect at the start of the demonstration.

Computation of Rates II: The Per-Episode Method

Under the per-episode method, agencies receive a single flat payment for each episode of care. Should a patient's length of stay exceed 120 days, payment for additional visits will be made using individual per-visit rates, computed in the same manner as for the per-visit method.

[1]For example, if total Medicare cost in Exhibit 5.2 were equal to $210,000, then reported costs per visit would be multiplied by $205,777/$210,000=0.9775 to arrive at payment rates.

1. Computation of Episode Payments

To compute episode payment rates, total Medicare cost is divided by the number of Medicare home health admissions in the base year. Admissions will be counted using the unduplicated Medicare census count from Worksheet S-1, Part I of the cost report. This rate will be multiplied by the appropriate HCFA Market Basket Index to arrive at appropriate per-episode rates for the first year of the demonstration. Rates will be adjusted for inflation in each year of the demonstration using the same index.

Per-visit rates will be computed for agencies assigned to the per-episode method in the same way as for agencies assigned to the per-visit method. Any visits provided to patients beyond the 120th day after their admission, will be paid on the basis of these rates.

2. Outlier Costs

Because visits provided after the 120th day following admission are not included in the per-episode rate, base year costs associated with such visits must be subtracted from total cost before dividing by the census count to compute the rate. Prior to rate setting, the Home Health 40 Percent Claims File will have been used to estimate the proportion of base year costs accounted for by visits within the first 120 days of care for each agency in the most recent year for which data are available. Total Medicare cost will be multiplied by this fraction and then divided by the census count. If, for example, 89 percent of Medicare cost were attributed to visits within the first 120 days for the hypothetical agency of Exhibit 5.2, then the agency's

per-episode rate would be (0.89) • ($204,750)/239 = $762. The rate in effect at the inception of the demonstration would be this amount times the appropriate Market Basket Index.

3. Cost Limits

No agency participating in the demonstration will be paid in excess of the Section 223 cost limits. In computing the per-episode rate the lesser of total Medicare cost and the cost limits will be used. As noted in Section 5.1, payment rates will not generally be compared to the limits during the demonstration unless the limits themselves change. However, because the loss-sharing provision of the demonstration operates only up to the Section 223 limits, the limits must be applied in order to determine the HCFA share of any losses. For per-episode agencies that experience losses in any year of the demonstration, a per-patient limit will be computed by dividing base year cost limits by the base year patient count and inflating by the Market Basket Index into the appropriate demonstration year. This amount will then be multiplied by the number of Medicare patients in the demonstration year to arrive at an agency demonstration year cost limit. If an agency's reimbursement under the prospective payment methodology is less than its total Medicare reimbursable cost, the difference, up to this cost limit, is reimbursable by Medicare at 95 percent.[1]

[1]Total Medicare cost is determined by allocating appropriate shares of total cost to nonreimbursable cost centers and allocating reimbursable costs to Medicare/non-Medicare based on numbers of patients.

4. Casemix Adjustment

After each full year of the demonstration, a casemix index will be computed for every agency in the demonstration. As noted in Section 5.1, there will be eight patient categories defined on the basis of information contained in the HCFA Forms 485/486. Computation of the casemix index begins with the calculation of Intensity Indices for each of the eight categories. The Intensity Index is defined as the ratio of the agency's FY 1990 mean reimbursement for patients in each category to its FY 1990 overall mean reimbursment per episode. Unless a major enhancement in the patient classification methodology is developed during the course of the demonstration, these Intensity Indices will remain unchanged throughout.

In order to compute an agency's casemix index for a given year, the shares of its episodes falling into each category in a given demonstration year will be computed using data from the Forms 485/486 supplied by the demonstration Fiscal Intermediary. An agency's casemix index is computed by multiplying the share of the agency's episodes that fall in each category by the category's Intensity Index and summing across all categories. (Each agency's casemix for FY 1990 must therefore equal one.) If an agency's patients have tended to fall into more resource-consuming categories in a demonstration year than in FY 1990, then the casemix index will exceed 1.0; if its patients have fallen into less resource-consuming categories, then the casemix index will fall below 1.0.

Each agency's casemix index will be recomputed every year. The prior year's payment rate will be retrospectively adjusted upward or downward by multiplying the rate by the appropriate casemix factor according to the following schedule:

If the Casemix Index is	The Per-Episode Rate Will be Multiplied by:
Greater than 1.224	1.25
Between 1.175 and 1.224	1.20
Between 1.125 and 1.174	1.15
Between 1.075 and 1.124	1.10
Between 1.025 and 1.074	1.05
Between 0.975 and 1.024	1.00
Between 0.925 and 0.974	0.95
Between 0.875 and 0.924	0.90
Between 0.825 and 0.874	0.85
Between 0.775 and 0.824	0.80
Less than 0.775	0.75

This rate (plus a market basket adjustment) will also be used as the provisional rate for the following year of the demonstration.

This process of annual rate recomputation leaves the agencies ignorant of their actual rates for a considerable period of time. In order to reduce the uncertainty about actual per-episode rates, the demonstration contractor will compute each agency's casemix index quarterly, based on the data contained in the Forms 485/486 and the Patient Intake Form. The casemix index will be communicated to each agency in the per-episode payment group as soon as it is available. With this information, agencies should be able to forecast their actual per-episode rates with reasonable accuracy.

6.0 EVALUATION PLAN

This chapter outlines a possible method for the evaluation of the National Home Health Agency Prospective Payment Demonstration. The evaluation will be conducted by an independent contractor, to be selected by HCFA. This section raises the major issues that will need to be considered in finalizing the design for this evaluation, and possible approaches to address them within the available data.

6.1 Evaluation Issues

There are many major issues which should be addressed by the evaluation. They include:

- Do prospective payment incentives alter the level and/or mix of home care services supplied to clients?
- What management, financial and organizational mechanisms have agencies employed to effectuate these changes in service use and expenditures?
- What have been the impacts of prospective payment incentives on the quality and appropriateness of home care services?
- What administrative burdens are created/relieved by using prospective payment methods of reimbursement?
- What have been the financial consequences of administrator response to prospective payment on agencies, on Medicare, and on other payors? Do prospective payment incentives reduce rates of increase in home care reimbursement and/or expenditures?
- What are the impacts of prospective payment incentives on client selection and retention?
- How do the above issues differ across the different prospective reimbursement approaches being tested?
- Are there differences in the above issues for agencies of different ownership, auspice, and location?

6.2 Discussion of Issues

Patient Care

A critical area for evaluation concerns the impact of prospective payment on Medicare home health care at the patient level.

- **Patient Mix**

The payment methods to be studied do not have obvious incentives to alter patient mix to optimize reimbursement. However, there may be opportunities for financial gain through specialization, which could have significant impacts on patient access to HHA services. Patient mix changes which occur, whether they are encouraged by payment incentives or not, are also directly related to cost issues: apparent savings generated because case mix has been changed may not be actual savings. On the other hand, it is conceivable that an economically optimal case mix for HHAs exists and, under prospective payment, HHAs would come closer to that case mix than under a cost reimbursement system. This case mix question is related to the issue of targeting home care benefits. It is fairly well established that episodes of home care services are more cost effective for some client groups than for others.[1] It is also a possibility that the financially optimal mix of patients for the HHA may not represent the mix which is more effective for the Medicare program as a whole.

- **Adequacy of Services**

Adequacy of services is a sensitive issue under prospective payment because the same incentives that help control costs include incentives to reduce the amount of service offered, since the price is fixed. The questions which must be addressed here are whether the changes in quality are potentially dangerous and, if so, how can they be best guarded against, using utilization monitoring or incentive reimbursement.

Impact on HHAs

A second general issue has to do with the impact of prospective payment on the HHAs themselves.

- **Impact on Financial Viability**

The general question is whether agencies were able to reap substantial profits or whether they encountered severe financial hardships. In practice, this question will most likely become a question of why some agencies did very well (were able to reduce spending) and others did very poorly. A related issue is whether financial gain or hardship was shifted, in part or total, to payors other than Medicare.

- **General Administrative Impacts**

The accommodations made by HHAs to comply with and adapt to various prospective payment approaches must be known prior to policymaking. What changes in HHA organization and procedures are detected which appear to be responses to the incentives of prospective payment, and what are the indications of these changes for the industry as a whole? Were there incentives to expand (or contract) mix of services or scale of operations? Has marketing or outreach been more aggressive and have financial priorities been elevated in importance within the organization? What are the administrative, and financial, impacts of prospective payment on the HHA? On the intermediary?

Expenditures

The third critical issue for the evaluation is whether or not prospective payment incentives can control home health care spending by Medicare. Prospective payment programs control the flow of revenue to HHAs by setting unit prices in advance; whether total revenue is controlled depends on both the stringency of these rates and the volume of services delivered. Whether HHAs control expenditures is totally a matter of administrator prerogative.

Thus, understanding the economic impacts of prospective payment requires consideration of several determinants of spending patterns.

- **Efficiency -- the cost of producing each unit**

In this setting, unit cost generally refers to cost per HHA visit, though the cost per admission or per month may be better indicators. The issue here is whether the incentives of prospective payment cause agencies to develop techniques for providing each unit of care more efficiently than would otherwise be the case. These economies may result from greater staff productivity, more disciplined wage and salary policies, more economical choices about contracting for selected services, streamlined administrative functions, or pursuit of economies of scale.

- **Volume -- the extent of economies of scale**

Prospective payment incentives are known to have strong influences on the volume of services provided. These incentives on visits, admissions and length of stay may work to increase or decrease expenditures on home or other health care services. Additionally, incentives may encourage more aggressive outreach activities, which increase admission rates and stimulate provision of services to more Medicare beneficiaries than would otherwise occur.

- **Source of Cost Saving -- how changes are accomplished**

It is also important to know how changes in spending are achieved. In part, this is a question of understanding how the HHAs changed their behavior to become more efficient (or to change visits per case or the number of admissions). One important concern is whether economies in home care spending are accompanied by increases in hospital or nursing home spending. This system cost impact could occur if one or more of the prospective payment methods provided inadequate services or if it created a strong disincentive to HHAs for serving the severely disabled or ill, which, in turn, led to longer lengths of stay in hospitals or earlier nursing home admissions.

General Evaluation Concerns

Finally, there are two general concerns that run through all the above specific issues.

- **Differences Among Models**

The demonstration will be testing two different approaches to prospective payment. These different approaches have been chosen precisely for the purpose of varying incentives to HHAs and it will be necessary to look at each of the above issues not only in terms of differences from the current cost-based reimbursement system, but also in terms of differences between the models being tested.

- **Lessons from the Demonstration**

A second general concern is that the evaluation should also be designed to highlight changes in either payment models or implementation procedures that would make prospective payment more effective if it is institutionalized as a national payment scheme. There are certain features of a demonstration project which make it impossible to include all the features of a national payment plan. (Consider the compromises in payment models which are necessary to ensure sufficient provider participation in a voluntary demonstration; e.g., under a full-fledged prospective payment system it would not be necessary to guarantee first-year budget neutrality.) The actual evaluation and interpretations of findings should, therefore, be sensitive to these limitations in the demonstration.

6.3 General Evaluation Approach

It will be very difficult to attribute performance differences on these key outcome areas to the incentives provided by prospective payment. The rapid growth in the industry, infusion of new treatment technologies, and

changing patient mix attributed to the PPS in hospitals are among the conditions present today that will blur the effects of the demonstration's payment incentives. The general evaluation strategy discussed here recognizes these threats and attempts to minimize their confounding influences in the following ways:

- Use of statistical modeling to supplement the randomized design. We recommend a four-way (pre-/pos-treatment/control) approach for computing program effects[2] controlling for exogenous catchment area and baseline organizational differences. The covariates and use of per-period data will reduce the variance in measures, helping to isolate small program effects which might otherwise be obfuscated.

- Large samples are needed to detect small effects. This can be done in three ways. We recommend extended base periods for all analyses, expanding the control group for some agency-level analyses to all agencies in study states, and the use of a census of Medicare patients in study areas (rather than a sample) for some analyses.

- Extensive reliance on person-level analysis using a one year followup period. Person-level analysis allows much more flexible and probably better control for patient mix influences on service needs. The data collection plan provides for measures of prior service use as a covariate in these analyses. A one-year followup for measuring home and ambulatory service use, inpatient substitution effects, and patient outcomes is recommended for the evaluation.

- The demonstration data collection design provides extensive data for analysis of case mix and home care patient classification issues. Ignorance of relationships between expenditures and patient mix is probably the greatest barrier to development of an equitable national prospective payment program for home care. The data collection plan provides a basis for conducting this analysis as part of the evaluation. Two levels of classification measures are provided in the data collection plan, allowing direct tests of the incremental value of adding more exact (and more burdensome) measures of patient condition to agency reporting requirements. The levels of measures include: (1) basic demographics, diagnosis, referral source, and hospital DRG (if referred from a hospital); (2) general information on functional status, living arrangements, prognosis and related elements required under HCFA's proposed Minimum Data Requirements for making coverage determinations and typic-

ally captured by agencies as part of the initial assessment process.

- Reliance on secondary data. It is possible to capture utilization, payment and financial information from cost report, claim and eligibility record systems. We recommend primary data collection only in support of the quality/appropriateness analysis; and even here we recommend retrieval of data from records rather than followup clinical assessments and patient surveys, both of which are expensive and provide measures of limited value.

- The evaluation should include a study of non-participant bias. Our data collection plan provides for capturing information from all agencies invited to participate. This data set should be used by the evaluator to examine the issue of systematic selection of agencies into the voluntary demonstration.

- Finally, the evaluation should rely heavily on case study information and patterns of statistical findings as a basis for interpretation. Some of the confounding influences (e.g., PPS, new technology, etc.) will make it impossible to strictly interpret the statistical estimates of impact. Case studies and site visits, particularly those scheduled following preliminary analysis, will be helpful in interpreting statistical findings.

To summarize the evaluation approach we provide a table (Exhibit 6.1) indicating the analytic files which need to be built, the uses to which each can be applied, and the sources of data for each. We briefly discuss these files here to provide an overview of the evaluation approach we recommend.

There are seven main sources of data for the evaluation.

1. Medicare Cost Reports and Financial Statements

The principal source of comparable agency level expenditure and utilization information is the annual Medicare Cost Report (MCR). These will be collected by the demonstration contractor for each of the 100 agencies for fiscal years after 1988. (The data design includes the 10-agency rural substudy, though it is not possible to pursue the same broad evaluation objectives with this sample alone.) Measures that can be drawn from this source include:

Exhibit 6.1

National Home Health Agency Prospective Payment Demonstration
Data Design for the Evaluation

Analytic File	Calendar Years*	Sample Size per Year	DATA SOURCES: MCR and Financials	223 Limit Tape File	Org. & Admin. Case Study	HCFA 485/486 Forms	Patient Intake Forms	HCFA Claims Data	Eligibility Files	Available for Use
HHA Year File	1988-93	100**	X					X		Expenditures; finances; volumes
	1991-93	100	X		X	X	X***	X		
Expanded HHA File	1988-93	All HHAs in 5 states		X						Expenditures; volumes
	1988-93			X				X		
Person File (Data on each from year before to year following admission)	1988-93	All admissions to 100 HHAs over 6 years				X	X	X	X	Utilization; readmissions; system cost; mortality; casemix
Record Sample File	1991-93	Samples of admissions in 100 HHAs				X	X	X	X	Utilization; readmissions; system cost; mortality; casemix

*The demonstration will start in FY 1991; prior years of data are considered baseline data.

**Composed of 60 prospective payment sites and 30 controls in the primary demonstration sample, plus 10 rural agencies.

***Available only during demonstration years (FY 1991-93).

- Average expenditures per visit by type of service (total SS and Medicare);
- Ratio of direct to overhead expenditures;
- Numbers of staff by function;
- Level of DME/medical appliances/supply expenditures;
- Volme of mix of visits by discipline (Total, Medicaid and Medicare) total;
- Various ratios of revenues to expenditures;

Additional financial information can be drawn from agency annual financial reports. Data elements of interest from Income Statements and Balance Sheets include:

- Revenue mix by payor source
- Profitability (surplus) measures;
- Liquidity and indebtedness measures;
- Asset use efficiency measures (revenues per dollar of equity, assets or indebtedness).

These statements (MCR and financial reports) will be collected directly from the 100 participating agencies by the demonstration contractor.

2. <u>223 Limit Tape File</u>

Annual agency level MCR information is routinely collected by HCFA for purposes of applying Section 223 reimbursement limits. This information is available on magnetic tape for most agencies in the nation, albeit on a delayed basis. Though limited in scope, this data set permits ready access to an expanded comparison group of agencies for the expenditure and volume analyses. The types of measures to be drawn from these data include:

- Cost per visit (by type); total and Medicare.
- Number of visits (by type); total and Medicare.

3. Organization Case Study

Annual organization interviews should be conducted, the purpose being to determine changes in agency policies and market circumstances which may serve to either (1) explain how agencies achieved measured changes in performance or (2) whether competing (confounding) explanations exist for observed performance. The discussions will also be used to capture some administrative and performance data (such as revenue by payor) which may be required by the statistical analysis as either performance measures or covariates.

The types of issues to be covered in these discussions are shown in Exhibit 6.2. The demonstration contractor will gather the information shown in Exhibit 4.3 for the base period and subsequent years from each of the 100 agencies in order to prepare progress summaries of the demonstration. The evaluation contractor should conduct site visits and collect information of the type shown in Exhibit 6.2.

4. HCFA 485/486 Forms

Each admission to home health care under Medicare generates a Certification and Plan of Treatment (HCFA-485) plus a Medical Update and Patient Information Form (HCFA-486). Supplementary data may also be generated (HCFA Forms 487, 488) in the course of eligibility and coverage determinations by the fiscal intermediary. For patients still receiving care at 60 days post-admission, at least a recertification form (HCFA-485) will be generated. In addition, significant chages in plans of care will be documented on these forms on an as-needed basis.

These forms, which will be received and processed by the FI, will be useful to the evaluation by providing data on:

- patient characteristics
- diagnosis and recent procedures

Exhibit 6.2

National Home Health Agency Prospective Payment Demonstration

Areas to be Covered in Evaluation Site Interviews

A. General Considerations

- Programmatic impacts of the prospective payment demonstration, especially changes in case mix.
- Fiscal impacts of the demonstration.
- Impact of prospective payment on long run agency plans.
- Changes in relationships with national headquarters or sponsoring agency.
- Overall assessment of impact of prospective payment, including suggestions to improve the system.

B. Changes in Practice Patterns

- Changes in intake procedures.
- Changes in overall case mix or mix of services for patients.
- Changes in development of plans of care.
- Changes in general treatment response to specific patient conditions.
- Changes in mechanisms for making working assignments.
- Changes in follow-up/monitoring mechanisms.
- Changes in quality assurance.
- Changes in discharge patterns and procedures.
- Services added or deleted.
- New patient markets addressed.

Exhibit 6.2 (continued)

C. Administrative Burden

- Additional specific administrative costs associated with the demonstration.
- Specific administrative problems associated with the demonstration.
- Administrative burdens relieved by the demonstration.
- Issues with the intermediary involving the administration of the demonstration.
- Suggestions for reducing the administrative burdens of prospective payment for home health care.

D. Personnel and Staffing

- Changes in salaries since beginning of demonstration.
- Any changes in personnel policies or recruiting.
- Any changes in personnel turnover rates. Related to demonstration?
- Any changes in use of specialists.

E. Cost Orientation

- Specific changes to control costs.
- Changes planned for future.
- Any reassessments of what costs can be well controlled and what costs are difficult to control. Assessment of subject agency in those areas.

F. External Relations

- Changes in relationships with physicians.
- Changes in relationships with hospitals, particularly discharge planning units.
- Changes in relationships with other parties.

- treatment needs, physician's orders
- mental status

5. Patient Intake Forms

For each Medicare patient admitted to the participating agencies, a standard set of data elements will be collected (see Appendix A). These data, supplementing those that are routinely gathered by agencies as part of the patient assessment process, will be available in this form only for the demonstration period. The intake data are valuable to the evaluation primarily as an additional source of information with which to examine patient classification and case mix adjustment options.

The types of measures which will be provided by this source at patient levels include:

- functional status
- household composition
- caregiver availability
- prognosis
- referral source

6. HCFA Claims Data

Patient specific measures of home care service use, use of other services, and estimates of total public program payments can be made from submitted billing and claim forms. For Medicare these data will be available for all study patients in the selected states.

Data retrieval from HCFA claims should focus on a two year period for every admitted patient. This two year period of Medicare claims retrieval should include the twelve months prior to, and the twelve months following admission. The latter is needed as the period over which use, spending and other evaluation outcome measures are defined. The former period provides

measures of prior service use, which is arguably the best control proxy for expected utilization and expenditures.

The types of annualized measures that can be made with the claims data are:

- hospital days of care (and expenditures);
- nursing home days of care (and expenditures);
- numbers of HHA visits (by type);
- numbers of physician and OPD visits (and spending);
- total Medicare billings.

7. Enrollment Files

Medicare enrollment files will be useful to the evaluation. Patient identifiers and eligibility information are used to identify relevant periods over which claims data are to be retrieved. Additionally, eligibility files can be used to measure patient attrition, both in terms of changes in eligibility status and death (an important outcome measure).

8. Catchment Area Data

To estimate program effects it is useful to control for certain area specific factors that vary across agencies within a state or even SMSA. Specifically, it would be useful to include items such as baseline values of:

- local hospital occupancy rates;
- Medicare days of hospital care per 1,000 enrolled population;
- size and structure of Medicare population;
- concentration of HHA providers;
- number and occupancy of nursing home beds;
- number and specialty mix of physicians.

These data are generally available on a county basis from secondary sources (e.g., Area Resource File). Given the focus on a small number of specific geographic areas, it may also be possible to use data from local sources to define more precise catchment areas in the five states.

6.4 Timetable for the Evaluation

The timetable for the evaluation is dictated by the schedule of demonstration activities. While baseline data collection and information on implementation activities can be gathered at any time, analyses of patient or agency impacts cannot be undertaken until HHAs have operated under demonstration conditions for a reasonable length of time. Given the retrospective nature of some of the payment adjustments (e.g., the volume adjustment, the casemix adjustment, the profit and risk sharing), it will not be until well into the demonstration that participating agencies know how they are being affected by the demonstration. Little useful analysis of impacts and agency responses could begin before then.

At the conclusion of the demonstration, it may be up to 12 or 18 months before cost reports are settled and all payment adjustments are completed.

6.5 Discussion of Selected Analytic Issues

Sample Design

The use of random assignment of agencies to payment alternatives would permit analysis to follow simple and straightforward treatment-control comparisons. However, since only 30 agencies are assigned to each group, the power to detect small effects is relatively low (see Chapter 5). To improve power (reduce variance), we recommend adding information in the form of baseline

data (on agencies and persons) and specifying other exogenous covariates within a multivariate framework.

We have further suggested increasing the power of the experimental design by increasing the number of control agencies for statistical analysis of expenditures and utilization. (These additional controls would not be part of the demonstration, like the primary control group, but would simply be additional cases for which data were available. The primary control group would still be used for analyses which require separate data collection.)

It is a very easy matter to expand the control sample for evaluation of unit cost differences. Per-visit cost data can readily be calculated for the cost reports routinely computerized for the purpose of calculating the Section 223 limits. It would not be a difficult matter to expand the control group enormously for the purpose of calculating changes in costs per visit. The only constraint is that not all HHAs are included on the 223 Cost Limit Tape; a large number of cost reports have not completed audit, are not forwarded by the intermediary, and so forth. However, it is not entirely clear that unit costs by themselves are a sufficiently meaningful measure that it makes sense to expand the control group to include all HHAs on the 223 Cost Limit Tape; hence, we recommend use of all HHAs in the five study states.

Expansion of the sample to include controls for number of visits per case is more difficult. Visits per case can no longer be determined from the Cost Limit Tape. Consequently, it is necessary to develop the number of visits (and type visits) per case not from the Cost Limit Tape, but from the individual claim level files. However, since it will be necessary to scan these files anyway, as will be discussed below, there will be little additional cost to expanding the control group.

Case Mix

A second problem with agency-level analysis relates to case mix. That is, both total visits per case and type of visits per case could change drastically if there were a significant shift in the type of cases receiving home health care -- if, for instance, changes in coverage or program administration result in the acceptance of sicker patients into home health care than had been the case at some earlier period. Theoretically, this could also affect the nature of unit costs -- where the unit is the visit -- but the problem is considerably less acute on a per-visit basis than for analyses based on cost per case.

It has been suggested that diagnosis is not a particularly good predictor of home health costs and that age, functional status and living arrangements are probably better predictors. Nevertheless, for agency-level analysis (expenditures, utilization) it is probably preferable to attempt to develop standardization for case mix based on diagnosis, which can be done with the claims data.[3] In large part, this is because the advantage of expanding the control group for cost analyses (with the claims) probably outweighs the weakness of this approach to case mix standardization. Moreover, while there are risks in incurring the expense necessary to test this approach, we believe the risks are worthwhile because of the large payoff if we could discover a relatively easy way of relating HHA case mix to routinely available information, particularly hospital DRGs. This approach is not exclusive. That is, if the evaluator feels this approach will not yield sufficient information, it can substitute its own approach within the available data.

The first step in this approach is to obtain hospital discharge information for the clients of HHAs in the study sites. While not all HHA patients

are discharged from hospitals immediately prior to service, a majority are,[4] even after the coverage changes which removed the prior hospitalization requirements for home health service eligibility. Certainly the percentage of recently discharged hospital patients will be large enough to gain some perspective on HHA case mix.

The above information can be developed by crossing individual HHA bills against hospital billing information. Both can be found in the HCFA 100 percent claims file. The crossing would seek to match HHA service recipients with previous hospital bills for some period -- say, the six months previous to the first date of HHA service. The 40 percent HHA claims file will permit more in-depth analysis by visit types, as the 100 percent file contains only visit totals.

The relevant hospital discharge data will include age, hospital length of stay, and DRG. It must also be remembered that there will be a fairly long lag time before the HCFA file contains the billing information germane to the actual baseline period. These data might not be available until well into the actual demonstration.

If the evaluator follows this basic approach, client age, client hospital length of stay and patient DRG can all be included to control for case mix in predicting the costs of HHAs in the absence of prospective payment.

In addition to hospital discharge data, a search of the HCFA file would also yield information on Medicare nursing home discharges. At the very least, it would be possible to identify whether a nursing home discharge occurred, if it was covered by the program.

At the same time, it makes sense to develop a more refined measure of case mix for HHAs. There are three reasons for doing so:

1. To provide some checks on the general validity of the model used above;

2. To insure that more subtle differences than are picked up by the above model are considered to the extent they are relevant; and,

3. To provide information on additional data items which, if uniformally collected, might lead to better approaches to the definition of HHA case mix.

The recommended approach to this problem is to analyze data from the 485/486 forms and to require participating agencies to complete a patient intake summary data sheet containing additional key data items on all Medicare admissions as part of the initial patient clinical evaluation.

Once these data are available for all recipients during the demonstration, it will not be difficult to measure changes in case mix across the various payment methods and to compare the results obtained from using the diagnosis-based measures of case mix with the measures made from the 485/486 forms and the patient intake form.

Adequacy of Care

One relatively easy measure of the adequacy of care will be the relative increase in expenditures for complementary services. Significantly higher expenditures in complementary services for prospective payment HHAs (all else being equal) would suggest a decreased level of quality. However, this cannot be used as the only measure. An HHA may continue to provide high quality services for recipients while they are being actively served by the HHA, but withdraw services if it perceives the patient has become or will become too expensive relative to the payment rates. We believe such a pattern would indeed constitute a quality problem, but it is a different kind of quality problem from that of an HHA which systematically under-provides services to recipients while they are in the program. To address the latter, a more specific evaluation must be undertaken.

The demonstration contractor will collect data on structural features of participating agencies and on indicators of quality. This would include UR practices, hiring and staff performance, monitoring practices, etc. Some quantitative indicators of quality will also be available for all Medicare patients. For example, mortality rates (for the 12-month post-admission period or shorter intervals), discharge destination, and length of stay will be available from claims and eligibility files. These measures are very imperfect indicators of client outcomes, though patterns among these and utilization measures may be indicative of quality of care impacts. These person-level data can be analyzed as such, or aggregated to the agency-year level. If the latter approach is used some form of standardization would be required so that indicators are not unduly influenced by patient mix differences across agencies over time.

Because quality problems are not likely to be distributed randomly across the patient population, but are more likely to show up in certain kinds of patients, we recommend that two samples for case reviews be targeted on high risk cases. Criteria for selecting these types of cases would be:

- high frequency;
- risk of serious adverse health effects resulting from inadequate levels of service.

With guidance, the quality assurance agency could select these case types and abstract records for information on pertinent service use, severity, and outcome indicators, particularly indications and timing of changes in function.

Quantitative Measures of Changes in Organizational Behavior

The quantitative assessment of organizational impacts should address three main issues: the nature of changes in HHA costs during prospective payment, the impact of prospective payment on other activities, and marginal cost considerations.

Agency Cost Changes. Earlier considerations addressed the changes in Medicare expenditures as a result of prospective payment. If in fact there were such changes, it is highly likely that agency behaviors were changed as a result of the different flow of funds. Changes in agency behavior can be understood in part by analysis of changes in agency expenditure patterns.

Analysis of the HHA cost reports will be able to give a general picture of agency expenses. Since 1985, the Cost Limit Tapes contain no detail on agency costs, other than stepped-down cost per visit. Hence, MCR data will be necessary to analyze changes in:

- Salaries (including hiring-contractual tradeoffs)
- Hours by type of personnel
- Overhead (including transportation, general administrative, and plant expenses)

Analysis of changes caused in these broad areas can, to a limited extent, be analyzed by ownership type and size if the expanded control group is used. More detailed analysis of cost changes can be developed from the hard copy cost reports for the demonstration agencies only.

Impact on Marketing Activities. Another relevant question for the evaluation will be the extent to which the prospective payment demonstration influences HHA marketing efforts. In part this will be addressed in the overall assessment of the effect of the demonstration on Medicare expenditures. If volume has increased in response to a prospective payment program, the assumption is that the agency increased marketing efforts. It will also be interesting to consider whether prospective payment pushes HHAs to diversify their activities and payment sources.

Data collected on the HHA cost report allows for some analysis of activities in which an HHA might be involved that are not eligible for HHA reimbursement. For instance, meals on wheels, adult day care or non-Medicare

homemaker services are separate cost centers on the HHA cost report. Analysis of that data would require the HHA cost reports as those centers are not carried individually on the Cost Limit Tape.

Collection of data on diversification of payment sources--additional delivery of services to patients other than Medicare--is more difficult because there is no easy way of determining the extent of such activities from the cost report. Medicare cost reports contain data which allow for analysis of the total number of Medicare visits and the number of non-Medicare visits, but there may well be differences in charges and costs between Medicare and non-Medicare visits. It is theoretically possible to determine the gross amount of non-Medicare patient revenue by subtracting the total Medicare claims (from the MADRS data) from the total revenue shown on the cost report. But such an exercise would result in extremely attenuated data. To pursue this issue, it will probably be necessary to collect specific data from the sample agencies on payor mix, particularly if there is interest in specific types of non-Medicare revenue.

Marginal Cost Considerations. One of the interesting questions in HHA cost analysis is the extent to which agency costs are variable with respect to volume changes. A related question is whether or not there are material economies of scale. The information necessary to address these questions is available on the 223 Cost Limit Tapes. If multiple years of these tapes are considered, the longitudinal nature of the resulting data will make it possible to estimate the impact of volume changes (where significant changes are observed) on unit costs within an agency. This data will become more meaningful under the prospective reimbursement payment where agencies will have greater incentives to take advantage of possible economies of scale or marginal cost savings.[5]

Ideally, this analysis would decompose expenditure changes into the portion due to changes in efficiency (cost per visit), changes in number of admissions, and changes in number of visits per admission.

Organizational Attributes and Other Non-Quantitative Issues

In addition to analysis of actual agency impacts, it will be important to understand agencies' attitudes toward the demonstration and also to gather their suggestions for ways of improving the payment mechanisms used. Likewise there will be some data elements which are not readily available from analysis of cost reports and other quantitative sources. The main data sources for this aspect of the evaluation will be a baseline agency questionnaire which is supplemented by an update at the end of each year in the demonstration. The baseline questionnaire will primarily address issues about agency organizational structure. Specific issues to be addressed in this questionnaire are itemized in the site protocol in Exhibit 4.3 Subsequent year questionnaires will address the agency attitudes toward the demonstration. Issues for those protocols are itemized in Exhibit 6.2, and include:

- Reaction to the prospective payment approach, including specification of problems and suggestions for improvement.
- Estimates of specific administrative burdens.
- Changes in agency practice patterns to control costs or better respond to incentives.
- Changes in marketing patterns and overall business plans.

It would be our general recommendation that the demonstration contractor would administer the protocol shown in Exhibit 4.3, modified as needed for subsequent years, by site visit and/or mail and telephone. The evaluator would probably also need to conduct site visits, to cover the issues noted here.

It would also be desirable for the evaluator to undertake a similar analysis of the fiscal intermediary's attitudes toward the demonstration, including their assessment of administrative burden and their suggestions for future use of prospective payment for HHAs.

CHAPTER 6 FOOTNOTES

1. Gaumer, G.L., et al. Impact of the New York State Long Term Health Care Program. Medical Care, Vol. 24, No. 7, July 1986.

2. Program effect is equal to the pre-post difference in treatment cases less the pre-post difference observed in control cases.

3. While data collection plan permits quite refined measures of case mix during the years of the demonstration (based on the 485/486 forms and the patient intake form), measures for the base period are not as good.

4. Cheh, V., Williams, J., and H. Goldberg. Medicare Home Health Care: Recent Trends in Users and Services Provided. Working paper, Abt Associates Inc., 1989.

5. Preliminary analysis by Abt Associates suggests an elasticity of average cost with respect to total visits of -0.18. That is, a one percent increase in visits is expected to reduce cost per visit by 0.18 percent.

Appendix A

PATIENT INTAKE DATA FORM

for the

NATIONAL HOME HEALTH AGENCY
PROSPECTIVE PAYMENT DEMONSTRATION

Home Health Agency Prospective Payment Demonstration

INSTRUCTIONS FOR COMPLETION OF PATIENT INTAKE DATA FORM

Patient Name

Enter the patient's name.

Agency Patient Number

Agencies may wish to assign a number to each patient for their own recordkeeping and record identification purposes. This item is for the convenience of the provider agency and is not required for project data collection purposes.

Provider Name

Enter the name of the provider.

Provider Number

Enter the 6 digit Medicare agency provider number. Agencies may wish to pre-enter this number.

Patient SS Number

Enter patient's 9 digit social security number.

Pt. Medicare Number

Enter patient's full Medicare number (including 1, 2, or 3 digit identifier).

Date of Birth

Use digits to indicate month, day of month, and the last two digits of the year (e.g. indicate May 4, 1989 by 05/04/89.

Date of First Visit

Enter the date of the first visit to the patient's home.

Indicator Conditions

If a patient has any of these conditions, place an "X" on the corresponding lines. Mark as many conditions as appropriate.

Treatment Needs

Place an "X" on the lines corresponding to the nursing procedures or special treatments being provided to the patient by the home health agency. Mark as many procedures as appropriate.

Activities of Daily Living

For each item, circle the number in the column which describes how each task is completed most of the time by the client. Use the following defenitions:

<u>EATING</u>: ***PROCESS OF GETTING FOOD BY ANY MEANS FROM THE RECEPTACLE INTO THE BODY (FOR EXAMPLE, PLATE, CUP, TUBE).***

1= Feeds self without supervision or physical assistance. May use adaptive equipment.

2= Requires intermittent supervision (that is, verbal encouragement/guidance) and/or minimal physical assistance with minor parts eating, such as cutting food, buttering bread or opening milk carton.

3= Requires continual help (encouragement/ teaching/physical assistance) with eating or meal will not be completed.

4= Totally fed by hand; client does not manually participate.

5= Tube or parenteral feeding for primary intake of food. (Not just for supplemental nourishments.)

<u>TRANSFER</u>: ***PROCESS OF MOVING BETWEEN POSITIONS, TO/FROM BED, CHAIR, STANDING (EXCLUDE TRANSFERS TO/FROM BATH AND TOILET).***

1= Requires no supervision or physical assistance to complete necessary transfers. May use equipment, such as railings, trapeze.

2= Requires intermittent supervision (that is, verbal cueing, guidance) and/or physical assitance for difficult maneuvers only.

3= Requires one person to provide constant guidance, steadiness and/or physical assistance. Patient participates in transfer.

4= Requires lifting equipment and one person to provide constant supervision and/or physically lift.

5= Cannot and is not gotten out of bed.

<u>DRESSING</u>: ***PROCESS OF GETTING CLOTHES FROM CLOSETS OR DRAWERS, PUTTING THEM ON (INCLUDING OUTER GARMENTS AND REQUIRED BRACES), AND MANAGING FASTENERS.***

1= Requires no human supervision or assistance. May use special equipment such as button-holers, shoelace hooks, long-handled shoe horns, or zipper pulls.

2= Requires some assistance from another person, such as selecting and laying out clothes, assistance with some garments, or intermittent supervision and/or encouragement.

3= Requires continual help from another person (encouragement, teaching, or physical assistance) in dressing.

4= Completely dependent on another person for dressing; does not/will not participate.

5= Wears bedgown; is not dressed.

<u>BATHING</u>: ***PROCESS OF WASHING BODY PARTS, INCLUDING GETTING TO THE BATHING WATER. THIS MAY INCLUDE THE SHOWER, BATHTUB, OR BED BATH.***

1= Requires no human supervision or support. May use adaptive equipment.

2= Requires intermittent checking and observing May require assistance for minor parts of the task, transferring in and out of the bath and bathing back.

3= Requires continual help (supervision or physical assistance) with most parts of bathing.

4= Client does not participate. Client is bathed in bath, shower or bed by another person.

TOILETING: ***PROCESS OF GETTING TO AND FROM TOILET (OR USE OF OTHER TOILETING EQUIPMENT, SUCH AS BEDPAN), TRANSFERRING AND OFF TOILET, CLEANSING SELF AFTER ELIMINATION AND ADJUSTING CLOTHES.***

1= Requires no supervision or physical assistance. May require special equipment, such as a raised toilet or grab bars.

2= Requires intermittent supervision for safety or encouragement; or minor physical assistance (for example, clothes adjustment or washing hands).

3= Continent of bowel and bladder. Requires constant supervision and/or physical assistance with major/all parts of task including appliances (i.e., colostomy, ileostomy, urinary catheter).

4= Incontinent of bowel and/or bladder, but is taken to a toilet every two to four hours during the day and as needed at night.

5= Incontinent of bowel and/or bladder, and is not taken to a toilet.

Instrumental Activities of Daily Living (ADLs)

For each item, circle the number in the column which describes how each task is completed most of the time by the client.

1. Totally able, with or without equipment.
2. Limited. Participates but does not complete task fully.
3. Unable to participate at all, or totally unwilling to participate.

Household Composition

Circle the numbers that best apply

Expected Outcome

Circle the number following the item which most closely describes the patient's anticipated outcome of care.

1. describes a patient with a health problem which, subsequent to home health care services, either will no longer exist or can be managed by the patient or the family.
2. describes a chronically ill or disabled patient with an acute illness which will no longer exist subsequent to home health care service provision. The patient is expected to return to the level of functioning which preceded the illness and/or the patient or the family will manage as independently as before this episode.
3. describes a chronically ill or disabled patient who is not expected to achieve the level of functioning which preceded the current episode of illness but the current level of functioning may increase and the patient will be able to function without home health services.
4. describes a chronically ill or disabled patient who, in order to remain at home, will require continued home health services.

5. describes a patient with a terminal condition. Home health services are to be provided to maintain the patient as comfortably as possible until needs can no longer be met in the home or until the patient dies.

Pre-Admission Location

Circle the number opposite the patient's location preceding admission. Enter the number of days the patient was in that location. There will be no entry if the patient was at home preceding admission.

Date Form Completed/ By Whom

Enter the date that this form was completed and name of staff person completing it.